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INDEX TO VOLUME 99, From July to December, 1909,

MINING AND SCIENTIFIC PRESS

| | Page. | | Page. |
|--|----------|---|----------|
| A | | B | |
| Abbreviating Code Messages.....Mark R. Lamb..... | 253, 556 | Assessment Work on Placer Claims.....Paul J. Case.... | 354 |
| Accident and Employers' Liability Laws, Industrial..... | | Atkinson, A. S.....Electrical Mine-Pumps in Europe.... | 334 |
|David Ross..... | 716 | Ditto.....Gas Engines for Mining Purposes.... | 300 |
| Insurance and Mine.....G. W. Traer..... | 717 | Austin, L. S...Calculation of Blast-Furnace Charges.... | 723 |
| Account Numbers.....H. E. West..... | 34 | Ditto.....Present Conditions at the Garfield | |
| Accuracy in Assays and Analyses. James W. Howson.... | 329 | Smelting Works..... | 590 |
| In Surveying.....Lee Fraser..... | 332 | Ditto.....The Root Positive-Blast Blower.... | 432 |
| Acid and Basic Processes, Relative Merits of..... | 756 | Australian Kimberley Exist? Does an John Plummer.... | 93 |
| Regeneration of Cyanide Solutions, Tests on..... | | Averill, Mark R....Excess Ground in Mining Claims.... | 493 |
|R. P. Wheelock..... | 814 | | |
| Adair, Alfred.....Cyanide History..... | 421 | B | |
| Address, Commencement.....John Hays Hammond..... | 600 | Balldon, S. Rivers.....Free Settlement Method of | |
| Adsorption, Colloids and.....E. K. Soper..... | 626 | Separating Slime..... | 556 |
| Agency, The Prospectors' and Miners'.....Editorial.... | 741 | Bain, H. Foster.....Petroleum Fields of Illinois.... | 153 |
| Agitation, Brown Type of Laboratory...T. S. Lawlor.... | 197 | Ditto.....Tunnel Driving in Colorado.... | 743 |
| Alaska and the Geological Survey.....Editorial.... | 644 | Ballagh, J. C., and K. Iwai..... | |
| District, Innoko..... | 228 |Investigation of Ferro-Boron.... | 185 |
| Drilling in Alluvial Ground in.....T. A. Rickard.... | 558 | Ballinger, Richard A.....Public Lands and | |
| Fairbanks Gold Region..... | 156 | Needed Legislation..... | 748 |
| Haines District.....W. A. Scott..... | 198 | Bannock, Nevada.....Charles S. Thomas.... | 820 |
| Innoko District..... | 228 | Barbour, Percy E.....Calculation of Blast- | |
| Pelly, Ross, and Gravel Rivers in.....J. Keele.... | 66 | Furnace Charges..... | 664 |
| Perseverance Mine, Juneau, Alaska..... | | Barnes, Charles S.....Platoro, Colorado.... | 224 |
|Company Report..... | 603 | Battery Plates, Sealing and Sweating of Copper..... | |
| Surveys Now Under Way..... | 67 |Sydney F. Goddard.... | 368 |
| White River Copper Properties..... | | Bear River District.....W. W. Rush.... | 152 |
|Guy A. R. Lewington..... | 755 | Bement, A.....Record in Tunnel Driving.... | 722 |
| Yakutat Bay Region..... | 719 | Bingham Canyon, The Story of....H. W. MacFarren.... | 129 |
| Alaskan Coal Lands, Conservation and.....Editorial.... | 813 | Utah, Yampa Smelter.....Leroy A. Palmer.... | 225 |
| Railways.....Editorial.... | 439 | Bird, Frank A.....Assay of Cyanide Precipitate.... | 504 |
| Aliens' Rights in Mining Claims.....H. B. Kaeding.... | 353 | Blast, A Large..... | 738 |
| All-Sliming.....Huxley St. J. Brooks..... | 760 | Blower, The Root Positive.....L. S. Austin.... | 432 |
| Ditto.....Edgar A. Collins..... | 389 | Furnace Charges, Calculation of....L. S. Austin.... | 723 |
| Ditto.....E. M. Hamilton..... | 255 | Ditto.....Percy E. Barbour.... | 664 |
| Ditto.....P. R. Whitman..... | 388 | Blasting Deep Holes.....O. H. Packer.... | 328 |
| Alluvial Ground in Alaska, Drilling in...T. A. Rickard.... | 558 | Blatchley, R. S....Drilling for Oil in Eastern Illinois.... | 613 |
| Alsace-Lorraine, Minerals in..... | 533 | Ditto.....Pumping and Shipping Oil | |
| Amalgamating Plates, Dressing..... | 503 | in Eastern Illinois..... | 678 |
| Amalgamation Experiments, Pan..... | | Boston Consolidated Mining Company..... | 641 |
|H. O. Hofman and C. R. Hayward.... | 529 | Boston-Sunshine Mill.....G. W. Wood.... | 295 |
| Uses and Limitations of Electrolytic....J. H. Jory.... | 476 | Bowers, George.....Natamas 1500-Ton | |
| American Institute Meeting.....Editorial.... | 438 | Plant for Crushing Dredge-Tailing..... | 609 |
| Merchant Marine.....Theo. F. Van Wagenen.... | 858 | Braden, Eugene B.....Smelter Versus Oil Fume.... | 192 |
| Ditto.....W. C. Wynkoop..... | 761 | Braden, William R...Costs at the Braden Copper Mine.... | 759 |
| Mining Congress.....336, 404, 435, 539 | | Bradford, A. H., and Roy P. Curtis..... | |
| Ditto.....Editorial.... | 371, 407 | Dredging at Breckenridge, Colorado.... | 361 |
| Smelting & Refining.....Company Report.... | 163 | Breckenridge, Colorado, Dredging at..... | |
| Andean Placers..... | 61 |A. H. Bradford and Roy P. Curtis.... | 361 |
| Angles with a 30-ft. Tape, Deflecting.Rufus J. Foster.... | 587 | Brick, Sand-Lime..... | 500 |
| Ditto.....Lee Fraser..... | 470 | Brockunier, S. H.....The First Rock-Drill.... | 53 |
| Anti-Dredging Convention, Sacramento..B. S. Noyes.... | 150 | Broken Hill Proprietary.....Company Report.... | 673 |
| Ditto.....W. B. Winston..... | 149 | Broken Hill South Silver Mining Company..... | |
| Apex, A Vein and Its.....J. W. Finch..... | 525 |Company Report.... | 738 |
| Application of Steel to Mine Timbering..... | 462 | Brooks, Huxley St. J.....All-Sliming.... | 760 |
|R. B. Woodworth..... | 462 | Brown Type of Laboratory Agitator...T. S. Lawlor.... | 197 |
| Archbold, T. R.....Photography in Mining.... | 431 | Brunton, David W...Modern Practice of Ore-Sampling.... | 593 |
| Are We Progressing?.....S. A. Worcester.... | 856 | Ditto.....Modern Progress in Mining and | |
| Argo Smelter, Closing of the.....Editorial.... | 337 | Metallurgy in the Western United States..... | 453 |
| Arizona Copper Company..... | 778 | Bullion Mining Co., Ltd.....Company Report.... | 738 |
| Copper Deposits of Silverbell...C. F. Tolman, Jr.... | 710 | Tax Law in Nevada.....Editorial.... | 677 |
| Copper Fields, The Southern..C. F. Tolman, Jr.... | 356, 390 | Bunker Hill & Sullivan.....Company Report.... | 673 |
| Disseminated Chalcocite Deposits at Ray..... | | Burchard, Ernest F.....Fluospas in Colorado.... | 258 |
|C. F. Tolman, Jr.... | 622 | Burma, Petroleum in.....E. A. Wakefield.... | 500 |
| Arkansas Diamond Fields.....Austin Q. Millar.... | 534 | Ruby Mines of the Mogok Valley..... | 231 |
| Arnold, Ralph, and H. R. Johnson.....Sodium Sulphate | | Burrows, R. H.....Geology of Northern Mexico.... | 290, 324 |
| in San Luis Obispo County, California.... | 855 | | |
| Art of Placer Piping.....Dennis H. Stovall.... | 661 | C | |
| Asbestine.....E. Schaaf-Regelman.... | 289 | Calrnes, D. D...Yukon Territory West of Lewes River.... | 29 |
| Ashley, Harrison Everett.....Slime.... | 289 | Calculation of Blast-Furnace Charges...L. S. Austin.... | 723 |
| Asphalt Production..... | 472 | Ditto.....Percy E. Barbour.... | 664 |
| Assay Balance, New Inverted Type..... | 475 | Of Slag.....G. I. Dinwiddle.... | 420 |
| Of Cyanide Precipitate.....Frank A. Bird.... | 504 | | |
| Assays and Analyses, Accuracy in James W. Howson.... | 329 | | |

MINING AND SCIENTIFIC PRESS

| | Page. | | Page. |
|---|----------|--|----------|
| Caldecott, W. A.....Continuous Collection of Sand for Cyaniding..... | 659 | Mine, Discovery of the Great.....R. H. Campbell..... | 524 |
| California, Consolidation of Mother Lode Mines..... | 828 | Ditto.....Dan De Quille..... | 22 |
| Fuel Oil, Calorific Value of.....R. W. Fenn..... | 874 | Mines Today.....Whitman Symmes..... | 24 |
| Historical Geology of.....William Forstner..... | 55, 91 | Semi-Centennial.....Editorial..... | 3 |
| Sodium Sulphate in San Luis Obispo County..... | 855 | Conservation and Alaskan Coal Lands.....Editorial..... | 813 |
| State Mineralogist Again.....Editorial..... | 644 | And Some Difficulties.....Horace V. Winchell..... | 819 |
| Calorific Value of California Fuel Oil.....R. W. Fenn..... | 874 | Of Natural Resources.....Editorial..... | 194 |
| Calumet & Hecla.....Company Report..... | 235 | Policy, Mr. Taft's.....Editorial..... | 510 |
| Camp, J. M.....Sampling Methods..... | 535 | Consolidated Mercur Gold Mines Co. Company Report..... | 507 |
| Campbell, R. H.....Discovery of the Great Comstock Mine..... | 524 | Consolidated M. & S. Co. of Canada, Limited..... | 603, 673 |
| Canadian Geological Survey..... | 32 |Company Report..... | 603, 673 |
| Carbons for Diamond-Drilling.....Importer..... | 625 | Consolidation of Mother Lode Mines.....W. H. Storms..... | 597, 828 |
| Carburetors for Gas-Engines at Mines.....E. N. Percy..... | 687 | Contingent Fees, Mr. Murphy on..... | 124 |
| Care of the Gas Engine.....L. H. Snyder..... | 624 | Continuous Collection of Sand for Cyaniding..... | 659 |
| Carter, T. Lane.....Mine Surveying Hints..... | 354 |W. A. Caldecott..... | 659 |
| Case, Paul J.....Assessment Work on Placer Claims..... | 354 | Filter, Oliver.....A. H. Martin..... | 715 |
| Cement and Monopoly, Portland.....Editorial..... | 206 | Revolving Silme Filter.....Edward Parrish..... | 253 |
| Chalcocite Deposits at Ray, Arizona, Disseminated..... | 622 | Sand-Filters.....F. C. Frey..... | 493 |
| Change of Method in Mining Soft Ore.....C. F. Tolman, Jr..... | 97 | Control in the Sacramento Valley Débris.....A. D. Foote..... | 688 |
| Channing, J. Parke.....Metal Losses in Copper Slags..... | 668 | Convention, Sacramento Anti-Dredging.....B. S. Noyes..... | 150 |
| Chart of Igneous Rocks.....Stuart Croasdale..... | 598 | Ditto.....W. B. Winston..... | 149 |
| Chase, Thorington.....Theory of Volcanic Action and Ore Deposition..... | 794 | Conversion Table, Vara.....Lee Fraser..... | 537 |
| Cherry Coal Mine Disaster.....Editorial..... | 741 | Coolidge, Roy F.....Zinc-Box White Precipitates..... | 394 |
| Chile, Great Steel Works in.....Editorial..... | 102 | Co-operative Topographic Surveys..... | 254 |
| Christmas 1909.....Editorial..... | 844 |Henry B. Kuemmel..... | 254 |
| Churn-Drill Gravel-Sampling.....J. P. Keene..... | 288 | Ditto.....Richard R. Hice..... | 85 |
| Drilling, Hand.....O. H. Packer..... | 296 | Ditto.....C. E. Sherman..... | 321 |
| Civil Service Reform.....C..... | 119 | Ditto.....I. C. White..... | 85 |
| Ditto.....Editorial..... | 39 | Copper Belt, Katanga.....F. E. Studt..... | 857 |
| Claims, Aliens' Rights in Mining.....H. B. Kaeding..... | 353 | Combination..... | 809 |
| Assessment Work on Placer.....Paul J. Case..... | 354 | Deposits of Silverbell, Arizona.....C. F. Tolman, Jr..... | 710 |
| Excess Ground in Mining.....Mark R. Averill..... | 493 | Fields, Southern Arizona.....C. F. Tolman, Jr..... | 356, 390 |
| Ditto.....Victor G. Hills..... | 587 | Game.....Editorial..... | 708 |
| Idle Mining.....Victor G. Hills..... | 625 | In Jamaica..... | 299 |
| Locating Placer.....A. H. Ricketts..... | 353 | In Southwestern Wisconsin.....G. H. Cox..... | 592 |
| Rejection of the Yard Mining.....Wm. E. Colby..... | 355 | Mine, Costs at the Braden.....William R. Braden..... | 759 |
| Ditto.....Editorial..... | 134 | Prices and Production.....Editorial..... | 70 |
| Classification of Public Lands.....Editorial..... | 272 | Producing Cost of.....Editorial..... | 167 |
| Ditto.....George Otis Smith..... | 229 | Properties, White River.....Guy A. R. Lewington..... | 755 |
| The Mining Man's Interest in Land.....George Otis Smith..... | 501 | Situation.....Editorial..... | 606 |
| Classifiers, Wilfley Tables at.....Bertram Hunt..... | 524 | Slags, Metal Losses in.....J. Parke Channing..... | 668 |
| Ditto.....H. W. Reed..... | 525 | Ditto.....Lewis T. Wright..... | 722 |
| Clemenceau and the New Industrialism.....Editorial..... | 103 | Cornish Pumping Engines, Compound..... | 62 |
| Clemens, Samuel L.....Comstock..... | 4 |W. Percy Gauvain..... | 62 |
| Closing of the Argo Smelter.....Editorial..... | 337 | Pumps.....F. F. Nickel..... | 54 |
| Coal and Iron in Japan.....Editorial..... | 38 | Corrosion, Protecting Steel from.....R. B. Woodworth..... | 560 |
| Lands, Conservation and Alaskan.....Editorial..... | 813 | Cost of Copper, Producing.....Editorial..... | 167 |
| Mine Disaster, The Cherry.....Editorial..... | 741 | Sheet for Mines.....Algernon Del Mar..... | 86 |
| Coalinga Oil District, Geology of.....William Forstner..... | 566 | Ditto.....Frederic Irwin..... | 18 |
| Coalite.....Bunker Hill & Sullivan..... | 370 | Costs at the Braden Copper Mine.....William R. Braden..... | 759 |
| Code, Guatemalan Mining..... | 202 | Cox, G. H.....Copper in Southwestern Wisconsin..... | 592 |
| Massages, Abbreviating.....Mark R. Lamb..... | 253, 556 | Crane, Recall of Mr.....Editorial..... | 511 |
| Colby, Wm. E.....Rejection of the Yard Mining Claims..... | 355 | Cripple Creek Telluride Ores, Researches Upon..... | 427 |
| Collins, Edgar A.....All-Sliming..... | 389 | Ditto.....Henry B. Haigh..... | 691 |
| Colloids and Adsorption.....E. K. Soper..... | 626 | Ditto.....Frank G. Peck..... | 859 |
| Colombia, Economic Conditions in.....Ernest H. Vaughan..... | 625 | Croasdale, Stuart.....Chart of Igneous Rocks..... | 598 |
| Placer Mining Conditions in.....L. J. Hohl..... | 182 | Crucible Assays.....George Doyle..... | 18 |
| Colorado, Dredging at Breckenridge..... | 361 | Cuba, Iron Ore in..... | 528 |
|A. H. Bradford and Roy P. Curtis..... | 361 | Cullen, William.....Gases Resulting from High Explosives..... | 297 |
| Fluorspar in.....Ernest F. Burchard..... | 258 | Curtis, Roy P., and A. H. Bradford..... | 361 |
| Gold Ore Near Newcastle.....Forbes Rickard..... | 503 |Dredging at Breckenridge, Colorado..... | 361 |
| Malm Process.....Forbes Rickard..... | 661 | Cyanidation of Manganese Silver Ores..... | 756 |
| Minerals, Gunnison County..... | 94 | Of Silver Ores.....Theo. P. Holt..... | 159 |
| Platoro.....Charles S. Barnes..... | 224 | Progress in.....George Mackenzie..... | 86 |
| Tunnel Driving in.....H. Foster Bain..... | 743 | Ditto.....Alfred James..... | 322 |
| Commencement Address.....John Hays Hammond..... | 600 | Ditto.....Alfred Adair..... | 421 |
| Commercial Orient.....Edward P. North..... | 422 | Ditto.....Bertram Hunt..... | 421 |
| Company Report.....Alaska Perseverance Mine, Juneau, Alaska..... | 603 | Ditto.....Alfred James..... | 420 |
| Ditto.....American Smelting & Refining..... | 163 | Precipitate, Assay of.....Frank A. Bird..... | 504 |
| Ditto.....Broken Hill Proprietary..... | 673 | Solutions, Tests on Acid Regeneration of..... | 814 |
| Ditto.....Broken Hill South Silver Mining Company..... | 738 |R. P. Wheelock..... | 814 |
| Ditto.....Bullion Mining Co., Ltd..... | 738 | Cyaniding Concentrate at Taracol, Korea..... | 471 |
| Ditto.....Bunker Hill & Sullivan..... | 673 | Continuous collection of Sand for.....W. A. Caldecott..... | 659 |
| Ditto.....Calumet & Hecla..... | 235 | Graphite—An Obstacle to Good..... | 758 |
| Ditto.....Consolidated Mercur Gold Mines Co..... | 507 |M. W. von Bernewitz..... | 758 |
| Ditto.....Consolidated M. & S. Co. of Canada, Limited..... | 603, 673 | Vacuum Pump in.....John S. MacArthur..... | 16 |
| Ditto.....Lake View Consols, Ltd..... | 777 | | |
| Ditto.....La Rose Consolidated Mines Company..... | 673 | D | |
| Ditto.....Montana-Tonopah Mining Co..... | 507 | Dakota, Mica Deposits of South.....Douglas B. Sterrett..... | 826 |
| Ditto.....Wahli Gold Mining Co., Ltd..... | 268 | Davis, William C.....Quicksilver in Nevada..... | 663 |
| Compound Cornish Pumping Engines..... | 62 | Davis Consolidated Hydraulic Mine..... | 849 |
|W. Percy Gauvain..... | 62 | Débris Control in the Sacramento Valley.....A. D. Foote..... | 688 |
| Comstock.....Mark Twain..... | 4 | From Oroville Dredges.....Editorial..... | 134 |
| Beginnings.....Joseph T. Goodman..... | 19 | Definition of Mining Terms, Official.....F. J. H. Merrill..... | 16 |
| Bullion.....G. McM. Ross..... | 149 | Deflecting Angles with a 30-ft. Tape.....Rufus J. Foster..... | 587 |
| Drainage Problems.....Leon M. Hall..... | 27 | Ditto.....Lee Fraser..... | 470 |
| | | De Kalb, Courtenay.....Mexican Mining Law..... | 99 |
| | | Ditto.....Mine Inspection..... | 497 |
| | | Ditto.....What Should an Engineer Know of Law?..... | 849 |
| | | Del Mar, Algernon.....Cost Sheet for Mines..... | 86 |
| | | Ditto.....Factors in Successful Gold Mining..... | 587 |
| | | Dennis, Clifford G.....Modern Quicksilver Reduction..... | 761 |

MINING AND SCIENTIFIC PRESS

| | | |
|--------------------------------------|--|----------|
| Economic Conditions in Colombia..... | Ernest H. Vaughan..... | 625 |
| Editorial..... | Alaska and the Geological Survey..... | 644 |
| Ditto..... | Alaskan Railways..... | 439 |
| Ditto..... | American Institute Meeting..... | 438 |
| Ditto..... | The American Mining Congress..... | 371, 407 |
| Ditto..... | Bullion-Tax Law in Nevada..... | 677 |
| Ditto..... | The Cherry Coal Mine Disaster..... | 741 |
| Ditto..... | Christmas 1909..... | 844 |
| Ditto..... | Civil Service Reform..... | 39 |
| Ditto..... | Classification of Public Lands..... | 272 |
| Ditto..... | Clemenceau and the New Industrialism..... | 103 |
| Ditto..... | Closing of the Argo Smelter..... | 337 |
| Ditto..... | Coal and Iron in Japan..... | 38 |
| Ditto..... | Comstock Semi-Centennial..... | 3 |
| Ditto..... | Conservation and Alaskan Coal Lands..... | 813 |
| Ditto..... | The Copper Game..... | 708 |
| Ditto..... | Copper Prices and Production..... | 70 |
| Ditto..... | The Copper Situation..... | 606 |
| Ditto..... | Débris from Oroville Dredges..... | 134 |
| Ditto..... | Ely Central and Its Critics..... | 709 |
| Ditto..... | Encouragement to Shipping..... | 676 |
| Ditto..... | The Extralateral Right..... | 406 |
| Ditto..... | Food and Mining in Mexico..... | 740 |
| Ditto..... | Gases from Explosives, and Mine Economy..... | 272 |
| Ditto..... | Genesis of Petroleum..... | 543 |
| Ditto..... | Geological Survey Estimates..... | 575 |
| Ditto..... | Geology as She Is Wrote..... | 812 |
| Ditto..... | Great Steel Works in Chile..... | 102 |
| Ditto..... | Edward Henry Harriman..... | 372 |
| Ditto..... | Mr. Heney's Defeat..... | 607 |
| Ditto..... | Leasehold System for Mineral Lands..... | 844 |
| Ditto..... | Legislation and National Revenue..... | 708 |
| Ditto..... | Mascot Copper Company..... | 239 |
| Ditto..... | Metal Markets and a Merchant Marine..... | 273 |
| Ditto..... | Mexican Banking System..... | 676 |
| Ditto..... | Mexican Mining Law..... | 7 |

E

| | |
|--|-----|
| F | |
| Factors in Successful Gold Mining, Algernon Del Mar..... | 587 |
| Fairbanks Gold Region, Alaska..... | 156 |
| Federal Mining Law, Reforms in..... Editorial..... | 372 |
| Fees, Mr. Murphy on Contingent..... | 124 |
| Fenn, R. W.....Calorific Value of California Fuel Oil..... | 874 |
| Ferro-Boron, Investigation of | |
|K. Iwal and J. C. Ballagh.... | 185 |
| Feust, Arthur.....Modern Quicksilver Reduction.... | 795 |
| Filter, Continuous Revolving Slime.. Edward Parrish..... | 253 |
| Continuous Sand..... F. C. Frey..... | 493 |
| Oliver Continuous..... A. H. Martin..... | 715 |
| Oliver Continuous Slime..... | 132 |
| Filters at Goldfield, Vacuum Slime..... | |
|Alfred Merritt Smith..... | 65 |
| Filtration, Pressure..... Ernest J. Sweetland..... | 853 |
| Finch, J. W..... A Vein and Its Apex..... | 525 |
| First Rock-Drill..... S. H. Brockunier..... | 53 |
| Flood and San Luisito Bridge, The Monterey..... | |
|Samuel J. Lewis..... | 494 |
| Flow of Water in Pipes, Velocity of, Leonard M. Green.... | 157 |
| Fluorspar Grades and Markets..... F. Julius Fohn..... | 720 |
| In Colorado..... Ernest F. Burchard..... | 255 |

MINING AND SCIENTIFIC PRESS

| | Page. | | Page. |
|---|----------|---|--------|
| Foels, F. Julius.....Fluorspar Grades and Markets.... | 720 | Heinly, Burt A....World's Record in Tunnel Driving.... | 539 |
| Food and Mining in Mexico.....Editorial.... | 740 | Hendryx, Wilbur A.....Slime Concentration..... | 388 |
| Foot, A. D., Débris Control in the Sacramento Valley.... | 688 | Henry's Defeat, Mr.....Editorial..... | 607 |
| Forest Service and Mining in the National Forests..... | | Herzig, C. S.....What Is an Ore?..... | 117 |
| Forstner, William.....Geology of the Coalinga Oil District..... | 618 | Ditto.....Ely Central..... | 722 |
| Ditto.....Historical Geology of California..... | 55, 91 | Hewes, L. I., and Joseph W. Roe.....Solution of Kutter's Formula..... | 429 |
| Ditto.....Legislation Regarding Oil Lands..... | 52 | Hice, Richard R.....Co-operative Topographic Surveys..... | 85 |
| Foster, Rufus J.....Deflecting Angles with a 30-ft. Tape.... | 587 | Hills, Victor G.....Excess Ground in Mining Claims..... | 587 |
| Fox, John M.....Diamond-Drilling at Tonopah..... | 262 | Ditto.....Idle Mining Claims..... | 625 |
| Fraser, Lee.....Accuracy in Surveying..... | 332 | Hindry, W. E.....Development at the Esperanza Mine, El Oro, Mexico..... | 822 |
| Ditto.....Deflecting Angles with a 30-ft. Tape.... | 470 | Ditto.....Mining Methods and Costs at the Esperanza Mine..... | 846 |
| Ditto.....Pan-Americanism..... | 829 | Historical Geology of California.William Forstner..... | 55, 91 |
| Ditto.....Vara Conversion Table..... | 537 | Hofman, H. O., and C. R. Hayward.....Pan-Amalgamation Experiments..... | 529 |
| Fraser River, Dredging on the.....John Watt..... | 452 | Hohl, L. J.....Placer Mining Conditions in Colombia..... | 182 |
| Free Settlement Method of Separating Slime.....S. Rivers Baildon..... | 556 | Holst, 500-hp. Electric Mining..... | 572 |
| Ditto.....Horace G. Nichols..... | 369 | Holmes, J. A.....Inspection of Mines..... | 499 |
| Freezing Method for Restraining Mine-Waters.....Edward H. Nutter..... | 617 | Holt, Theo. P.....Cyanidation of Silver Ores..... | 159 |
| Frey, F. C.....Continuous Sand Filters..... | 493 | Homestake Mines, Strike at the.....Editorial..... | 780 |
| Fund, A Waterways.....Editorial..... | 645 | Hornsilver District, Nevada.....F. L. Ransome..... | 433 |
| Furnace, A New Muffle..... | 437 | Howe, Albion S.....Gases from Explosives and Mine Economy..... | 422 |
| G | | Howson, James W.....Accuracy in Assays and Analyses..... | 329 |
| Garfield Smelting Works, Present Conditions at the....L. S. Austin..... | 590 | Huancavelica, Peru, Quicksilver at Lester W. Strauss..... | 561 |
| Gas Engine, Care of the.....L. H. Snyder..... | 624 | Hubbard, J. D.....Cyaniding Concentrate at Taracol, Korea..... | 471 |
| Engines.....Mark R. Lamb..... | 459 | Hughes, A. F.....Stripping a Vein by Hydrauliclicking..... | 788 |
| Engines at Mines, Carburetors for.....E. N. Percy..... | 687 | Hungarian Rifles, Saving Gold with..... | 261 |
| Engines for Mining Purposes.....A. S. Atkinson..... | 300 | Hunt, Bertram.....Cyanide History..... | 421 |
| Gases from Explosives, and Mine Economy.....Editorial..... | 272 | Ditto.....Wilfley Tables as Classifiers..... | 524 |
| Ditto.....Albion S. Howe..... | 422 | Hydraulic Dredging for Gold.....Henry G. Granger..... | 35 |
| Resulting from High Explosives.....William Cullen..... | 297 | Mine, Davis Consolidated..... | 849 |
| Gauvain, W. Percy.....Compound Cornish Pumping Engines..... | 62 | Mine Equipment for Panama..... | 99 |
| Genesis of Petroleum.....Editorial..... | 543 | Hydrauliclicking, Stripping a Vein by.....A. F. Hughes..... | 788 |
| Geological and Physical Conditions of Tonopah Mines.....Walter P. Jenney..... | 685 | I | |
| Survey, Alaska.....Editorial..... | 644 | Idle Mining Claims.....Victor G. Hills..... | 625 |
| Survey, Canadian.....Edward H. Nutter..... | 32 | Igneous Rocks, Chart of.....Stuart Croasdale..... | 598 |
| Survey of India..... | 557 | Illinois, Drilling for Oil in Eastern.....R. S. Blatchley..... | 613 |
| Survey Estimates.....Editorial..... | 575 | Petroleum Fields of.....H. Foster Bain..... | 153 |
| Survey Field Work..... | 267 | Pumping and Shipping Oil in.....R. S. Blatchley..... | 678 |
| Survey of Virginia..... | 87 | Impounding Mill Tailing.....H. W. MacFarren..... | 338 |
| Surveys, State..... | 31 | India, Geological Survey of..... | 557 |
| Geology as She Is Wrote.....Editorial..... | 812 | Industrial Accidents and Employers' Liability Laws.....David Ross..... | 716 |
| Of California, Historical.....William Forstner..... | 55, 91 | Industrialist, Clemenceau and the New.....Editorial..... | 103 |
| Of the Coalinga Oil District.....William Forstner..... | 566 | Inks, Ancient and Modern..... | 167 |
| Of Northern Mexico.....R. H. Burrows..... | 290, 324 | Innoko Alaska District..... | 228 |
| Goddard, Sydney F.....Scaling and Sweating of Copper-Battery Plates..... | 368 | Inspection Again, Mine.....Editorial..... | 542 |
| Gold and Scheelite Near Macraes, New Zealand.....Percy Morgan..... | 33 | Mine.....Courtenay De Kalb..... | 497 |
| Dredging, Hydraulic.....Henry L. Granger..... | 35 | Of Mines.....J. A. Holmes..... | 499 |
| Dredging in Siberia.....J. B. Landfield..... | 423 | Insurance and Mine Accidents.....G. W. Traer..... | 717 |
| In Eastern Nicaragua.....Clarence Carleton Semple..... | 221 | Inverted Type Assay Balance, New..... | 475 |
| Losses in Dredging, Platinum and.....Thos. H. Leggett..... | 323 | Investigation of Ferro-Boron.....K. Iwai and J. C. Ballagh..... | 185 |
| Ditto.....W. B. Winston..... | 234 | Investors, Protecting Mine.....Editorial..... | 478 |
| Mines, Oregon, Rye Valley.....Auguste Mathez..... | 687 | Protection of.....George A. Packard..... | 52 |
| Mining, Factors in Successful.....Algernon Del Mar..... | 587 | Ditto..... | 38 |
| Ore Near Newcastle, Colorado.....Forbes Rickard..... | 503 | Iron in Japan, Coal and.....Editorial..... | 528 |
| Territory in Peru, Opening New.....Editorial..... | 406 | Ore in Cuba.....Cost Sheet for Mines..... | 1 |
| Goldfield Mill Improvements..... | 825 | Iwai, K., and J. C. Ballagh.....Investigation of Ferro-Boron..... | 185 |
| Vacuum Slime-Filters at.....Alfred Merritt Smith..... | 65 | J | |
| Goodman, Joseph T.....Comstock Beginnings..... | 19 | Jamaica, Copper in..... | 299 |
| Granger, Henry G.....Hydraulic Dredging for Gold..... | 35 | James, Alfred.....Cyanide History..... | 420 |
| Granites.....Gordon Surr..... | 712 | Ditto.....Progress in Cyanidation..... | 322 |
| Graphite—An Obstacle to Good Cyaniding.....M. W. von Bernewitz..... | 758 | Janes, Byron E.....Designing Mine Equipment..... | 669 |
| Gravel Rivers, Pelly, Ross, and.....J. Keele..... | 66 | Japan, Coal and Iron in.....Editorial..... | 38 |
| Sampling, Churn-Drill.....J. P. Keene..... | 288 | Jefferson Canyon, Nevada.....George A. Packard..... | 26 |
| Great Steel Works in Chile.....Editorial..... | 102 | Jenney, Walter P.....Geological and Physical Conditions of Tonopah Mines..... | 685 |
| Green, Leonard M.....Velocity of Flow of Water in Pipes..... | 157 | Johnson, H. R., and Ralph Arnold.....Sodium Sulphate in San Luis Obispo County, California..... | 855 |
| Grown, A Nugget Which May Have..... | 718 | Jory, J. H.....Uses and Limitations of Electrolytic Amalgamation..... | 476 |
| Guatemalan Mining Code..... | 202 | Jupiter Reduction Works, Simmer Deep.J. E. Thomas.... | 396 |
| Guides, Pacific Stem..... | 540 | K | |
| H | | Kaeding, H. B.....Aliens' Rights in Mining Claims.... | 353 |
| Halgh, Henry B.....Researches Upon Cripple Creek Telluride Ore..... | 691 | Kapsan Mines, Korea..... | 666 |
| Haines District, Alaska.....W. A. Scott..... | 198 | Katanga Copper Belt.....F. E. Studt..... | 857 |
| Hall, Leon M.....Comstock Drainage Problems..... | 27 | Keele, J.....Pelly, Ross, and Gravel Rivers..... | 66 |
| Hamilton, E. M.....All-Sliming..... | 255 | Keene, J. P.....Churn-Drill Gravel-Sampling..... | 288 |
| Ditto.....Cyanidation of Manganese Silver Ores..... | 756 | Kinetic Theory of Solids..... | 667 |
| Hammond, John Hays.....Commencement Address..... | 600 | Kirby, Edmund B.....Paralysis of Mining Districts..... | 467 |
| Hand-Churn Drilling.....O. H. Packer..... | 296 | Korea, Cyaniding Concentrate at Taracol..... | 471 |
| Harriman, Edward Henry.....Editorial..... | 372 | J | |
| Hayward, C. R., and H. O. Hofman.....Pan-Amalgamation Experiments..... | 529 | | |

| | Page. | | Page. |
|--|---|---|---------------------------------|
| Kapsan Mines | 666 | Mica Deposits of South Dakota.. | Douglas B. Sterrett.... 826 |
| Mineral Areas in | 499, 572 | Miller, Austin Q. | Arkansas Diamond Fields.... 534 |
| Kuempel, Henry B. | Co-operative Topo- | Mine Equipment, Designing..... | Byron E. Janes.... 669 |
| graphic Surveys | 254 | Inspection | Courtenay De Kalb.... 497 |
| Kutter's Formula, Solution of | | Inspection Again..... | Editorial.... 542 |
| ..... | L. I. Hewes and Joseph W. Roe.... 429 | Investors, Protecting | Editorial.... 478 |
| | | Investors, Protection of | 505 |
| | | Surveying Hints..... | T. Lane Carter.... 354 |
| | | Waters, Freezing Method for Restraining..... | Edward H. Nutter.... 617 |
| L | | Mineral Areas in Korea..... | 499, 572 |
| Lake View Consols, Ltd. | Company Report.... 777 | Deposits in Fiji | 23 |
| Lamb, Mark R. | Abbreviating Code Messages.... 253, 556 | Deposits in Trebizond..... | 198, 299 |
| Ditto | Gas Engines.... 459 | Land, Patenting..... | George A. Packard.... 526 |
| Land Classification, Mining Man's Interest in | | Lands, Leasehold System for..... | Editorial.... 844 |
| ..... | George Otis Smith.... 501 | Production of Virginia in 1908..... | T. L. Watson.... 196 |
| Patenting Mineral..... | George A. Packard.... 526 | Mineralogist Again, State..... | Editorial.... 644 |
| Taxing Unoperated Mineral..... | Editorial.... 306 | Minerals in Uruguay | 162 |
| Landfield, J. B. | Gold Dredging in Siberia.... 423 | Miners' Unions | Observer.... 828 |
| Ditto | A Russian Money Trust.... 287 | Mines, Inspection of..... | J. A. Holmes.... 499 |
| Lands and Needed Legislation, Public | | Mining and Metallurgy in the Western United States..... | |
| ..... | Richard A. Ballinger.... 748 | Modern Progress in..... | David W. Brunton.... 453 |
| Classification of Public..... | Editorial.... 272 | Claims, Aliens' Rights in..... | H. B. Kaeding.... 353 |
| Ditto | George Otis Smith.... 229 | Claims, Excess Ground in..... | Mark R. Averill.... 493 |
| Leasehold System for Mineral..... | Editorial.... 844 | Ditto | Victor G. Hills.... 587 |
| Lane, Louis..... | Santa Eulalia Camp.... 16 | Claims, Idle..... | Victor G. Hills.... 625 |
| La Rose Consolidated Mines Company..... | | Claims, Rejection of the Yard..... | Wm. E. Colby.... 355 |
| ..... | Company Report.... 673 | Ditto | Editorial.... 134 |
| Law Governing Oil Lands, Proposed..... | 60 | Claims, Vein Continuity on..... | H. W. M.... 54 |
| In Nevada, Bullion Tax..... | Editorial.... 677 | Congress, American | 336, 404, 435, 539 |
| Industrial Accidents and Employers' Liability..... | | Ditto | Editorial.... 371, 407 |
| ..... | David Ross.... 716 | Congress, Resolutions Adopted by the American..... | 539 |
| What Should an Engineer Know of..... | | Districts, Paralysis of..... | Edmund B. Kirby.... 467 |
| ..... | Courtenay De Kalb.... 849 | Engineer, The Qualified..... | John M. Nicol.... 794 |
| Lawlor, T. S. | Brown Type Laboratory Agitator.... 197 | Exchange, Nevada City..... | Editorial.... 2 |
| Lawton, E. M. | Mining in Oaxaca, Mexico.... 232 | In Northern Sinaloa, Mexico..... | E. A. H. Tays.... 120 |
| Leasehold System for Mineral Lands..... | Editorial.... 844 | In Oaxaca, Mexico..... | E. M. Lawton.... 232 |
| Leggett, Thos. H. | Platinum and Gold | In the National Forests, Forest Service and..... | |
| Losses in Dredging..... | 323 | ..... | W. W. Dyar.... 618 |
| Legislation and National Revenue..... | Editorial.... 708 | Law, Mexican | Editorial.... 71 |
| Public Lands, and Needed..... | Richard A. Ballinger.... 748 | Ditto | Courtenay De Kalb.... 99 |
| Regarding Oil Lands..... | William Forstner.... 52 | Law, Reforms in Federal..... | Editorial.... 372 |
| Levy, Ernest..... | Murex Magnetic Process.... 777 | Magazine | Editorial.... 439 |
| Lewes River, Yukon Territory..... | D. D. Cairnes.... 29 | Man's Interest in Land Classification..... | |
| Lewington, Guy A. R. | White River Copper Properties.... 755 | ..... | George Otis Smith.... 501 |
| Lewis, Samuel J. | Monterey Flood and | Methods and Costs at the Esperanza Mine..... | |
| San Luisito Bridge | 491 | ..... | W. E. Hindry.... 846 |
| Locating Placer Claims..... | A. H. Ricketts.... 353 | Soft Ore, Change of Method in..... | |
| Loftus, J. P. | Round Mountain Mines and History.... 568 | ..... | Stuart Rhett Elliott.... 97 |
| Loram, S. H. | Placers of Tierra del Fuego.... 125 | Technical Knowledge of..... | 128 |
| Losses in Copper Slags, Metal..... | J. Parke Channing.... 668 | Terms, Official Definitions of..... | F. J. H. Merrill.... 16 |
| Ditto | Lewis T. Wright.... 722 | Modern Practice of Ore Sampling..... | David W. Brunton.... 593 |
| In Dredging, Platinum and Gold..... | Thos. H. Leggett.... 323 | Progress in Mining and Metallurgy in the Western | |
| Ditto | W. B. Winston.... 231 | United States | David W. Brunton.... 453 |
| | | Quicksilver Reduction..... | Clifford G. Dennis.... 761 |
| | | Ditto | Arthur Feust.... 705 |
| | | Ditto | H. W. Turner.... 690 |
| M | | Mogok Valley, Burma, Ruby Mines of the..... | 231 |
| MacArthur, John S. | Vacuum-Pump in Cyaniding.... 16 | Moisture in Ores..... | Editorial.... 2 |
| MacFarren, H. W. | Impounding Mill Tailing.... 333 | Money Trust, A Russian..... | Jerome B. Landfield.... 287 |
| Ditto | Ozokerite in Utah.... 789 | Ditto | C. W. Purlington.... 626 |
| Ditto | The Story of Bingham Canyon.... 129 | Ditto | George E. Walsh.... 195 |
| Mackenzie, George..... | Progress in Cyanidation.... 86 | Montana-Tonopah Mining Co. | Company Report.... 507 |
| Madill Oil Pool, Oklahoma..... | 691 | Monterey Flood and San Luisito Bridge..... | |
| Magnetic Process, Murex..... | Ernest Levy.... 777 | ..... | Samuel J. Lewis.... 494 |
| Separation | 592 | Morgan, Percy..... | Gold and Scheelite Near |
| Malm Process in Colorado..... | Forbes Rickard.... 662 | Macraes, New Zealand..... | 33 |
| Manganese in the United States..... | 90 | Mother Lode Mines, Consolidation of..... | |
| Sliver Ores, Cyanidation of..... | E. M. Hamilton.... 756 | ..... | W. H. Storms.... 597, 828 |
| Marine, American Merchant..... | Theo. F. Van Wagenen.... 858 | Muffle-Furnace, A New..... | 437 |
| Ditto | W. C. Winkoop.... 761 | Munroe, Charles E. | Explosives in the United |
| Metal Markets and a Merchant..... | Editorial.... 273 | States During the Last Three Years..... | 681 |
| Martin, A. H. | Oliver Continuous Filter.... 715 | Murex Magnetic Process..... | Ernest Levy.... 777 |
| Mascot Copper Company..... | Editorial.... 239 | Mr. Murphy on Contingent Fees..... | 124 |
| Mason, F. H. | Nostrums.... 201 | | |
| Ditto | Radium Emanation.... 425 | | |
| Mathes, Auguste..... | Rye Valley Gold Mines, Oregon.... 687 | | |
| Mendenhall, W. C. | Underground Waters | | |
| in Semi-Arid Regions..... | 496 | | |
| Merrill, F. J. H. | Official Definitions of Mining Terms.... 16 | | |
| Ditto | Santa Eulalia Camp.... 119 | N | |
| Metal Losses in Copper Slags..... | J. Parke Channing.... 668 | National Forests, The Forest Service and Mining in the..... | |
| Ditto | Lewis T. Wright.... 722 | ..... | W. W. Dyar.... 618 |
| Markets and a Merchant Marine..... | Editorial.... 273 | National Revenue, Legislation and..... | Editorial.... 708 |
| Mexican Banking System..... | Editorial.... 676 | Natomas 1500-Ton Plant for Crushing Dredge-Tailing..... | |
| Mining Law..... | Courtenay De Kalb.... 99 | ..... | George Bowers.... 609 |
| Ditto | Editorial.... 71 | Natural Resources, Conservation..... | 194 |
| Situation, Phases of the..... | Editorial.... 271 | Nevada, Bannock..... | Charles S. Thomas.... 820 |
| Mexico, Development at the Esperanza Mine, El Oro..... | | Bullion-Tax Law in..... | Editorial.... 677 |
| ..... | W. E. Hindry.... 822 | City Mining Exchange..... | Editorial.... 2 |
| Food and Mining in..... | Editorial.... 740 | Jefferson Canyon..... | George A. Packard.... 26 |
| Geology of Northern..... | R. H. Burrows.... 290, 324 | Geological and Physical Conditions of Tonopah Mines | |
| Mining in Northern Sinaloa..... | E. A. H. Tays.... 120 | ..... | Walter P. Jenney.... 685 |
| Mining in Oaxaca..... | E. M. Lawton.... 232 | Hornsilver District..... | P. L. Ransome.... 433 |
| Mining Methods and Costs at the Esperanza Mine..... | | quicksilver in..... | William C. Davis.... 663 |
| ..... | W. E. Hindry.... 846 | Round Mountain..... | P. L. Ransome.... 568 |
| Prospects at Zacatecas..... | Previewer.... 387 | Round Mountain Mines and History..... | J. P. Loftus.... 568 |
| Miami-Inspiration Ore-Zone..... | C. F. Tolman, Jr.... 646 | Seven Troughs District of..... | P. L. Ransome.... 790 |
| | | New Proposal for Silver..... | Theo. F. Van Wagenen.... 150 |

MINING AND SCIENTIFIC PRESS

| | Page. |
|--|---|
| New Zealand, Gold and Scheelite Near Macraes..... | 33 |
| Placer Mines | 5 |
| Newcastle, Colorado, Gold Ore Near..Forbes Rickard.... | 503 |
| Newlands, Francis G..... | Ship Subsidies.... 690 |
| Nicaragua, Gold in Eastern..... | 221 |
|Clarence Carleton Semple.... | 221 |
| Pacification of | Editorial..... 740 |
| Nichols, Horace G..... | Free Settlement Method of |
| Separating Slime | 369 |
| Ditto..... | Theory of the Settlement of Slime.... 252 |
| Nickel, F. F..... | Cornish Pumps.... 54 |
| Nicol, John M..... | Placers of Waldo, South Oregon.... 122 |
| Ditto..... | The Qualified Mining Engineer.... 794 |
| North, Edward P..... | The Commercial Orient.... 422 |
| Nostrums..... | F. H. Mason.... 201 |
| Noyes, B. S..... | The Sacramento Anti- |
| Dredging Convention | 150 |
| Nugget Which May Have Grown..... | 718 |
| Nutter, Edward H..... | Freezing Method for |
| Restraining Mine Waters..... | 617 |

O

| | | |
|--|-----------------------|----------|
| Oaxaca, Mexico, Mining in..... | E. M. Lawton..... | 232 |
| Official Definitions of Mining Terms.. | F. J. H. Merrill.... | 16 |
| Oil, Caloric Value of California Fuel... | R. W. Penn.... | 874 |
| District, Geology of the Coalinga..... | William Forstner..... | 566 |
| Fume, Smelter Versus..... | Eugene B. Braden.... | 18 |
| In Eastern Illinois, Drilling for..... | R. S. Blatchley.... | 613 |
| In Eastern Illinois, Pumping and Shipping..... | R. S. Blatchley.... | 678 |
| Lands, Legislation Regarding..... | William Forstner.... | 52 |
| Lands, Proposed Law Governing..... | | 60 |
| Pool, Oklahoma, Madill..... | | 601 |
| Oklahoma, The Madill Oil Pool..... | | 601 |
| Oliver Continuous Filter..... | A. H. Martin..... | 715 |
| Continuous Slime Filter..... | | 132 |
| Opening New Gold Territory in Peru..... | Editorial..... | 406 |
| Ore Deposition, Development of Modern Theories of..... | S. F. Emmons..... | 400 |
| Deposition, Theory of Volcanic Action and..... | Thorington Chase..... | 794 |
| Sampling, Modern Practice of..... | David W. Brunton.... | 593 |
| What is an..... | C. S. Herzlg..... | 117 |
| Zone, The Miami-Inspiration..... | C. F. Tolman, Jr.... | 646 |
| Orebodies, Outcrop of..... | Editorial..... | 781 |
| Ditto..... | William H. Emmons.... | 751, 782 |
| Oregon, Placers of Waldo, South..... | John M. Nicol..... | 122 |
| Rye Valley Gold Mines..... | Auguste Mathez.... | 687 |
| Orient, The Commercial..... | Edward P. North.... | 422 |
| Oroville Dredges, Débris from..... | Editorial..... | 131 |
| Outcrop of Orebodies..... | Editorial..... | 781 |
| Ditto..... | William H. Emmons.... | 751, 782 |
| Oxygen in Coal..... | | 399 |
| Ozokerite in Utah..... | H. W. MacFarren.... | 78 |

P

| | |
|---|--|
| Pacific Stem Guides..... | 510 |
| Pacification of Nicaragua..... | Editorial..... 740 |
| Packard, George A..... | Jefferson Canyon, Nevada..... 26 |
| Ditto..... | Patenting Mineral Land..... 526 |
| Ditto..... | Protection of Investors..... 52 |
| Packer, O. H..... | Blasting Deep Holes..... 336 |
| Ditto..... | Hand-Churn Drilling..... 296 |
| Palmer, Leroy A.... | Yampa Smelter, Bingham, Utah..... 225 |
| Pan-Amalgamation Experiments | |
| ..... | H. O. Hofman and C. R. Hayward..... 529 |
| Pan-Americanism | Editorial..... 812 |
| Ditto | Lee Fraser..... 829 |
| Panama, Hydraulic Mine Equipment for..... | 99 |
| Patents and Patent Office..... | 168 |
| Paralysis of Mining Districts..... | Edmund B. Kirby..... 467 |
| Parrish, Edward..... | Continuous Revolving Slime Filter..... 253 |
| Ditto | Slime..... 492 |
| Patenting Mineral Land..... | George A. Packard..... 526 |
| Peck, Frank G..... | Researches Upon Cripple Creek Telluride Ore..... 859 |
| Pelly, Ross, and Gravel Rivers..... | J. Keele..... 66 |
| Percy, E. N..... | Carburetors for Gas Engines at Mines..... 687 |
| Permissible Explosives | 644 |
| Peru, Opening New Gold Territory in..... | Editorial..... 406 |
| Quicksilver at Huancavelica..... | Lester W. Strauss..... 561 |
| Petroleum Fields of Illinois..... | H. Foster Bain..... 153 |
| Genesis of | Editorial..... 543 |
| In Burma..... | E. A. Wakefield..... 500 |
| Production in 1908..... | 236 |
| Production, World's | 750 |
| Phases of the Mexican Situation..... | Editorial..... 271 |
| Philippine Placer Mining | 267 |
| Phosphate Deposits of the United States | |
| ..... | Frank B. Van Horn..... 88 |

| | Page. |
|--|---------------------------------|
| Photography in Mining..... | T. R. Archbold... 421 |
| Placer Claims, Assessment Work on..... | Paul J. Case... 354 |
| Claims, Locating..... | A. H. Ricketts... 353 |
| Ground, Drill-Log for..... | William H. Radford... 94 |
| Mines in New Zealand..... | 58 |
| Mining Conditions in Colombia..... | L. J. Howl... 132 |
| Mining, Philippine..... | 267 |
| Piping, Art of..... | Dennis H. Stovall... 661 |
| Placers, Andean..... | 61 |
| Of Tierra del Fuego..... | S. H. Loram... 125 |
| Of Waldo, South Oregon..... | John M. Nicol... 122 |
| Platinum and Gold Losses in Dredging..... | Thos. H. Leggett... 323 |
| Ditto..... | W. B. Winston... 274 |
| Platoro, Colorado..... | Charles S. Barnes... 234 |
| Plummer, John, Does an Australian Kimberley Exist?..... | 93 |
| Plummet-Wires in Deep-Shaft Surveying, Divergence of..... | W. E. Downs... 322 |
| Pole and the Flag..... | Editorial... 338 |
| Porter, Frank R..... | Slime Concentration... 253, 690 |
| Portland Canal, Bear River District..... | W. W. Rush... 152 |
| Cement and Monopoly..... | Editorial... 206 |
| Postal Rates on Specimens..... | D. W. Reckhart... 184 |
| Present Conditions at the Garfield Smelting Works..... | L. S. Austin... 590 |
| President Taft and Shipping Rates..... | Editorial... 479 |
| Pressure Filtration..... | Ernest J. Sweetland... 853 |
| Producing Cost of Copper..... | Editorial... 167 |
| Progress in Cyanidation..... | Alfred James... 322 |
| Ditto..... | George Mackenzie... 86 |
| In Mining and Metallurgy in the Western United States, Modern..... | David W. Brunton... 453 |
| Progressing? Are We..... | S. A. Worcester... 856 |
| Proposal for Silver, New..... | Theo. F. Van Wagenen... 150 |
| Proposed Law Governing Oil Lands..... | 60 |
| Prospectors' and Miners' Agency..... | Editorial... 741 |
| Prospects at Zacatecas..... | Previsor... 387 |
| Protecting Mine-Investors..... | Editorial... 478 |
| Steel from Corrosion..... | R. B. Woodworth... 560 |
| Protection of Investors..... | George A. Packard... 52 |
| Of Mine Investors..... | 505 |
| Protective Tariff..... | Editorial... 238 |
| Public Lands and Needed Legislation..... | Richard A. Ballinger... 748 |
| Lands, Classification of..... | Editorial... 272 |
| Ditto..... | George Otis Smith... 229 |
| Pumping and Shipping Oil in Eastern Illinois..... | R. S. Blatchley... 678 |
| Engines, Compound Cornish..... | W. Percy Gauvain... 62 |
| Pumps, Cornish..... | F. F. Nickel... 334 |
| In Europe, Electrical Mine..... | A. S. Atkinson... 334 |
| Purlington, C. W..... | A Russian Money Trust... 626 |
| Ditto..... | Tyutcha Zinc Mine... 230 |

Q.

| | | |
|--|-------------------------|-----|
| Qualified Engineers | Editorial | 843 |
| Mining Engineer..... | John M. Nicol..... | 794 |
| Quicksilver at Huancavelica, Peru..... | Lester W. Strauss..... | 561 |
| In Nevada..... | William C. Davis..... | 663 |
| Reduction, Modern..... | Clifford G. Dennis..... | 791 |
| Ditto..... | Arthur Feust..... | 795 |
| Ditto..... | H. W. Turner..... | 690 |

R

| | | |
|--|---|-----|
| Radeliff, S., and J. Drevermann..... | Treatment of Sulphide Ores in Victoria..... | 367 |
| Radium Emanation..... | F. H. Mason..... | 425 |
| Ore..... | | 332 |
| Ditto..... | E. Schaaf-Regelman..... | 432 |
| Railways, Alaskan..... | Editorial..... | 430 |
| Ransome, F. L..... | Hornsilver District, Nevada..... | 433 |
| Ditto..... | Round Mountain, Nevada..... | 568 |
| Ditto..... | Seven Troughs District of Nevada..... | 700 |
| Rates on Specimens, Postal..... | D. W. Reckhart..... | 184 |
| Ray, Arizona, Disseminated Chalcocite Deposits at..... | | |
| | C. F. Tolman, Jr..... | 622 |
| Recall of Mr. Crane..... | Editorial..... | 541 |
| Reckhart, D. W..... | Postal Rates on Specimens..... | 184 |
| Reclamation Service Rumors..... | Editorial..... | 134 |
| Records in Tunnel Driving..... | A. Bement..... | 722 |
| In Tunnel Driving, World's..... | Burt A. Heintz..... | 589 |
| Reed, H. W..... | Wildley Tables as Classifiers..... | 525 |
| Reform, Civil Service..... | | 149 |
| Ditto..... | Editorial..... | 43 |
| In Federal Mining Law..... | Editorial..... | 372 |
| Rejection of the Yard Mining Claims..... | Wm. E. Colby..... | 355 |
| Ditto..... | Editorial..... | 134 |
| Researches Upon Cripple Creek Telluride Ores..... | | 427 |
| Ditto..... | Henry B. Haigh..... | 691 |
| Ditto..... | Frank G. Peck..... | 859 |
| Resolutions Adopted by the American Mining Congress..... | | 599 |
| Responsibility, Engineering..... | Charles B. Dudley..... | 45 |
| Rhodes, Charles..... | Walsh Gold Mines..... | 32 |

MINING AND SCIENTIFIC PRESS

| Page. | Page. |
|--|--|
| Rickard, Forbes, Gold Ore Near Newcastle, Colorado.... 503 | Versus Oil Fume..... Eugene B. Braden.... 192 |
| Ditto..... Malm Process in Colorado.... 662 | Smelting Works, Present Conditions at the Garfield.... 590 |
| Rickard, T. A., Drilling in Alluvial Ground in Alaska.... 558 | L. S. Austin.... 590 |
| Ricketts, A. H., Locating Placer Claims.... 353 | Smith, Alfred Merritt..... Vacuum Slime-Filters |
| Rilles, Saving Gold with Hungarian.... 261 | at Goldfield..... 65 |
| Rights in Mining Claims, Aliens'..... H. B. Kaeding.... 353 | Smith, George Otis..... Classification of Public Lands.... 229 |
| Roe, Joseph W., and L. I. Hewes..... Solution of Kutter's Formula.... 129 | Ditto..... Mining Man's Interest in |
| Root Positive-Blast Blower..... L. S. Austin.... 432 | Land Classification..... 501 |
| Ross, and Gravel Rivers, Pelly..... J. Keele.... 66 | Snyder, L. H..... Care of the Gas Engine.... 624 |
| Ross, David..... Industrial Accidents and | Sodium Sulphate in San Luis Obispo County, California.... 855 |
| Employers Liability Laws..... 716 | Soft Ore, Change of Method in Mining..... 97 |
| Ross, G. McM..... Comstock Bullion.... 149 | Stuart Rhett Elliott.... 97 |
| Round Mountain Mines and History..... J. P. Loftus.... 568 | Solution of Kutter's Formula..... L. I. Hewes and Joseph W. Roe.... 429 |
| Mountain Nevada..... F. L. Ransome.... 568 | Soper, E. K..... Colloids and Adsorption.... 626 |
| Ruby Mines of the Mogok Valley, Burma.... 231 | South America, Placers of Tierra del Fuego..... S. H. Loram.... 125 |
| Rush, W. W..... Bear River District.... 152 | South Dakota, Mica Deposits of, Douglas B. Sterrett.... 826 |
| Russian Money Trust..... Jerome B. Landfield.... 287 | Southern Arizona Copper Fields, C. F. Tolman, Jr.... 356, 390 |
| Ditto..... C. W. Purlington.... 626 | Specimens, Postal Rates on..... D. W. Reckhart.... 184 |
| Ditto..... George E. Walsh.... 195 | Spirit Levelling..... 537 |
| Rye Valley Gold Mines, Oregon..... Auguste Mathes.... 687 | Spring Stamps..... 642 |
| S | |
| Sacramento Anti-Dredging Convention... B. S. Noyes.... 150 | Standardizing Electrical Mine-Equipment..... 370 |
| Ditto..... W. B. Winston.... 149 | State Geological Surveys..... 31 |
| Valley, Débris Control in the..... A. D. Foote.... 688 | Mineralogist Again..... Editorial.... 644 |
| Sampling, Churn-Drill Gravel..... J. P. Keene.... 288 | Steam Low-Pressure Turbines, Exhaust.... 304 |
| Methods..... J. M. Camp.... 535 | Steel From Corrosion, Protecting... R. B. Woodworth.... 560 |
| Modern Practice of Ore..... David W. Brunton.... 593 | To Mine Tinbering, Application of..... R. B. Woodworth.... 462 |
| San Luis Obispo County, California, Sodium Sulphate in..... Ralph Arnold and H. R. Johnson.... 855 | Works in Chile, Great..... Editorial.... 102 |
| Sand Filters, Continuous..... F. C. Frey.... 493 | Sterrett, Douglas B., Mica Deposits of South Dakota.... 826 |
| For Cyaniding, Continuous Collection..... W. A. Caldwell.... 659 | Storms, W. H., Consolidation of Mother Lode Mines.... 597, 828 |
| Lime Brick..... 500 | Story of Bingham Canyon..... H. W. MacFarren.... 129 |
| Santa Eulalia Camp..... Louis Lane.... 16 | Stovall, Dennis H..... Art of Placer Piping.... 661 |
| Ditto..... F. J. H. Merrill.... 119 | Strange, W. W..... English in Our Technical Journals.... 668 |
| Saving Gold with Hungarian Rilles..... 261 | Strauss, Lester W..... Quicksilver at |
| Sealing and Sweating of Copper-Battery Plates..... Sydney F. Goddard.... 368 | Huancavelica, Peru..... 561 |
| Schaaf-Regelman, E..... Asbestine.... 289 | Strike at the Homestake Mines..... Editorial.... 780 |
| Ditto..... Radium Ore.... 122 | Stripping a Vein by Hydraulic Mining..... A. F. Hughes.... 788 |
| Ditto..... Turquoise.... 366 | Studd, F. E..... Katanga Copper Belt.... 857 |
| Schlichte and Gold near Macraes, New Zealand..... Percy Morgan.... 33 | Sulphide Ores in Victoria, Treatment of..... S. Radcliff and J. Drevermann.... 367 |
| Scott, W. A..... Haines District, Alaska.... 198 | Surr, Gordon..... Granites.... 712 |
| Selby Fume Case..... Editorial.... 166 | Surveying, Accuracy in..... Lee Fraser.... 332 |
| Simple Clarence Carleton, Gold in Eastern Nicaragua.... 324 | Divergence of Plummets-Wires in Deep Shaft..... W. E. Downs.... 322 |
| Separation, Magnetic..... 592 | Hints, Mine..... T. Lane Carter.... 354 |
| Settlement Method of Separating Slime, Free..... S. Rivers Baidon.... 556 | Surveys, Co-operative Topographic, Richard R. Hice.... 85 |
| Ditto..... Horace G. Nichols.... 369 | Ditto..... Henry B. Kuemmel.... 254 |
| Of Slime, Theory of the..... Horace G. Nichols.... 252 | Ditto..... C. E. Sherman.... 321 |
| Seven Troughs District of Nevada..... F. L. Ransome.... 790 | Ditto..... J. C. White.... 85 |
| Shaft-Surveying, Divergence of Plummets-Wires in Deep..... W. E. Downs.... 322 | Now Under Way, Alaska..... 67 |
| Sherman, C. E., Co-operative Topographic Surveys.... 324 | Sweetland, Ernest J..... Pressure Filtration.... 853 |
| Ship Subsidies..... Frances G. Newlands.... 690 | Symmes, Whitman..... The Comstock Mines Today.... 24 |
| Shipping, Encouragement to..... Editorial.... 676 | |
| Rates, President Taft and..... Editorial.... 479 | |
| Shovels, Electrically Driven Power..... 263 | |
| Siamese Railway and Minerals..... 430 | |
| Siberia, Gold Dredging in..... J. B. Landfield.... 423 | |
| Tyutcha Zinc Mine..... Chester W. Purlington.... 200 | |
| Silica, Determination of..... 559 | |
| Silver, A New Proposal for... Theo. F. Van Wagenen.... 150 | |
| Ores, Cyanidation of..... Theo. P. Holt.... 159 | |
| Ores, Cyanidation of Manganese... E. M. Hamilton.... 756 | |
| Silverbell, Arizona, Copper Deposits of..... C. F. Tolman, Jr.... 710 | |
| Simmer Deep and Jupiter Reduction Works..... J. E. Thomas.... 396 | |
| Sinaloa, Mexico, Mining in Northern... E. A. H. Tays.... 120 | |
| Slag Calculation..... G. I. Dinwiddle.... 420 | |
| Slime..... Harrison Everett Ashley.... 289 | |
| Ditto..... Edward Parrish.... 492 | |
| Concentration..... C.... 182 | |
| Ditto..... Wilbur A. Hendryx.... 388 | |
| Ditto..... Frank R. Porter.... 253, 690 | |
| Filter, Continuous Revolving..... Edward Parrish.... 256 | |
| Filters at Goldfield, Vacuum Alfred Merritt Smith.... 65 | |
| Filters, Oliver Continuous..... 132 | |
| Free Settlement Method of Separating..... S. Rivers Baidon.... 556 | |
| Ditto..... Horace G. Nichols.... 369 | |
| Theory of the Settlement of..... Horace G. Nichols.... 252 | |
| Sliming, All..... Huxley St. J. Brooks.... 760 | |
| Ditto..... Edgar A. Collins.... 389 | |
| Ditto..... E. M. Hamilton.... 255 | |
| Ditto..... P. R. Whitman.... 389 | |
| Sludge Abatement..... Editorial.... 574 | |
| Smelter, Closing of the Argo..... Editorial.... 337 | |
| Fume and Equity..... Editorial.... 306 | |
| T | |
| Taft and Shipping Rates, President..... Editorial.... 479 | |
| Taft's Conservation Policy..... Editorial.... 510 | |
| Tailing, Impounding Mill..... H. W. MacFarren.... 333 | |
| Natomas 1500-Ton Plant for Crushing Dredge..... George Bowers.... 609 | |
| Taracol, Korea, Cyaniding Concentrate at..... J. D. Hubbard.... 471 | |
| Tariff, Protective..... Editorial.... 238 | |
| Taxing Unoperated Mineral Land..... Editorial.... 306 | |
| Tays, E. A. H., Mining in Northern Sinaloa, Mexico.... 120 | |
| Technical Journals, English in..... W. W. Strange.... 668 | |
| Technical Knowledge of Mining..... 128 | |
| Telegraphic Code..... Editorial.... 237 | |
| Telluride Ores, Researches Upon Cripple Creek..... 427 | |
| Ditto..... Henry B. Haigh.... 691 | |
| Ditto..... Frank G. Peck.... 859 | |
| Tests on Acid Regeneration of Cyanide Solutions..... R. P. Wheelock.... 814 | |
| Theory of the Settlement of Slime, Horace G. Nichols.... 252 | |
| Of Volcanic Action and Ore Deposition..... Thornton Chase.... 794 | |
| Thomas, Charles S..... Bannock, Nevada.... 820 | |
| Thomas, J. E..... Simmer Deep and | |
| Jupiter Reduction Works..... 396 | |
| Tierra del Fuego, Placers of..... S. H. Loram.... 125 | |
| Timbering, Application of Steel in Mine..... R. B. Woodworth.... 462 | |
| Time-Sheet Voucher..... W. P. Dunham.... 760 | |
| Tolman, Jr., C. F..... Copper Deposits of | |
| Silverbell, Arizona..... 710 | |
| Ditto..... Disseminated Chalcocite De- | |
| posits at Ray, Arizona..... 622 | |
| Ditto..... The Miami-Inspiration Ore-Zone.... 646 | |
| Ditto..... Southern Arizona Copper Fields.... 356, 390 | |
| Tonopah, Diamond-Drilling at..... John M. Fox.... 262 | |
| Mines, Geological and Physical Conditions of..... Walter P. Jenney.... 685 | |

MINING AND SCIENTIFIC PRESS

| | Page. | | Page. |
|---|-------|--|-------|
| Topographic Surveys, Co-operative..Richard R. Hice.... | 85 | W | |
| Ditto.....Henry B. Kuemmel.... | 254 | Waihi Gold Mines.....Charles Rhodes.... | 323 |
| Ditto.....C. E. Sherman.... | 321 | Waihi Gold Mining Co., Ltd.....Company Report.... | 268 |
| Ditto.....I. C. White.... | 85 | Wakefield, E. A.....Petroleum in Burma.... | 500 |
| Traer, G. W.....Insurance and Mine Accidents.... | 717 | Waldo, South Oregon, Placers of.....John M. Nicol.... | 122 |
| Treatment of Sulphide Ores in Victoria..... | | Walsh, George E.....A Russian Money Trust.... | 195 |
|S. Radcliff and J. Drevermann.... | 367 | Water in Pipes, Velocity of Flow of.....Leonard M. Green.... | 157 |
| Trebizond, Mineral Deposits in..... | 198, | Waters, Freezing Method for Restraining Mine..... | |
| Tungsten..... | 299 |Edward H. Nutter.... | 617 |
| Tunnel Driving in Colorado.....H. Foster Bain.... | 743 | in Semi-Arid Lands, Underground..... | |
| Driving, Records in.....A. Bement.... | 722 |W. C. Mendenhall.... | 496 |
| Driving, World's Record in.....Burt A. Heinly.... | 589 | Waterways Fund.....Editorial.... | 645 |
| Turbines, Exhaust Steam Low-Pressure..... | 391 | Watson, T. L.....Mineral Production of Virginia | |
| Turner, H. W.....Modern Quicksilver Reduction.... | 690 | in 1908..... | 196 |
| Turquoise.....E. Schaaf-Regelman.... | 556 | Watt, John.....Dredging on the Fraser River.... | 152 |
| Tyuticha Zinc Mine.....Chester W. Purlington.... | 200 | Weir Measurements..... | 265 |
| | | West, H. E.....Account Numbers.... | 34 |
| U | | What is an Ore?.....C. S. Herzig.... | 117 |
| Underground Waters in Semi-Arid Regions..... | | Should an Engineer Know of Law?..... | |
|W. C. Mendenhall.... | 496 |Courtenay De Kalb.... | 849 |
| Unions, Miners'.....Observer.... | 828 | Wheelock, R. P.....Tests on Acid Regeneration of | |
| United States During the Last Three Years, Explosives | | Cyanide Solutions..... | 814 |
| in the.....Charles E. Munroe.... | 681 | White River Copper Properties.....Guy A. R. Lewington.... | 755 |
| Geological Survey Field Work..... | 267 | White, I. C.....Co-operative Topographic Surveys.... | 85 |
| Uruguay, Minerals in..... | 162 | Whitman, P. R.....All-Sliming.... | 388 |
| Uses and Limitations of Electrolytic Amalgamation..... | | Wilfey Tables as Classifiers.....Bertram Hunt.... | 524 |
|J. H. Jory.... | 476 | Ditto.....H. W. Reed.... | 525 |
| Utah, Ozokerite in.....H. W. MacFarren.... | 789 | Winchell, Horace V.....Conservation and Some | |
| The Story of Bingham Canyon.....H. W. MacFarren.... | 129 | Difficulties..... | 819 |
| Yampa Smelter, Bingham.....Leroy A. Palmer.... | 225 | Winston, W. B.....Platinum and Gold Losses in | |
| | | Dredging..... | 234 |
| V | | Ditto.....The Sacramento Anti-Dredging Convention.... | 149 |
| Vacuum-Pump in Cyaniding.....John S. MacArthur.... | 16 | Wlaconsin, Copper in Southwestern.....G. H. Cox.... | 592 |
| Slime-Filters at Goldfield....Alfred Merritt Smith.... | 65 | Wire-Rope Sockets..... | 475 |
| Van Horn, Frank B.....Phosphate Deposits | | Wood, G. W.....Boston-Sunshine Mill.... | 295 |
| of the United States..... | 88 | Woodworth, R. B.....Application of Steel to Mine | |
| Van Wagenen, Theo. F.....American Merchant Marine.... | 858 | Timbering..... | 462 |
| Ditto.....New Proposal for Silver.... | 150 | Ditto.....Protecting Steel from Corrosion.... | 560 |
| Vara Conversion Table.....Lee Fraser.... | 537 | Worcester, S. A.....Are We Progressing?.... | 856 |
| Vaughan, Ernest H. Economic Conditions in Colombia.... | 625 | World's Record in Tunnel Driving...Burt A. Heinly.... | 589 |
| Vein and Its Apex.....J. W. Finch.... | 525 | Wright, Lewis T.....Metal Losses in Copper Slags.... | 722 |
| By Hydraulic Stripping a.....A. F. Hughes.... | 788 | Wynkoop, W. C.....American Merchant Marine.... | 761 |
| Continuity on Mining Claims.....H. W. M.... | 54 | | |
| Velocity of Flow of Water in Pipes.....Leonard M. Green.... | 157 | Y | |
| Victoria, Treatment of Sulphide Ores..... | | Yakutat Bay Region..... | 719 |
|S. Radcliff and J. Drevermann.... | 367 | Yampa Smelter, Bingham, Utah.....Leroy A. Palmer.... | 225 |
| Virginia Geological Survey for the Season 1909..... | 87 | Yard Mining Claims, Rejection of the..Wm. E. Colby.... | 355 |
| In 1908, Mineral Production.....T. L. Watson.... | 196 | Ditto.....Editorial.... | 134 |
| Volcanic Action and Ore Deposition, Theory of..... | | Yukon Territory West of Lewes River..D. D. Cairnes.... | 29 |
|Thorington Chase.... | 794 | | |
| Von Bernewitz, M. W.....Graphite—An | | Z | |
| Obstacle to Good Cyaniding..... | 758 | Zacatecas, Prospects at.....Previsior.... | 387 |
| | | Zinc-Box White Precipitates.....Roy F. Coolidge.... | 394 |
| | | Zinc Mine, The Tyuticha.....Chester W. Purlington.... | 200 |

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TABLE OF CONTENTS.

EDITORIAL:

Page.

| | |
|-----------------------------------|---|
| Notes | 1 |
| Nevada City Mining Exchange | 2 |
| Comstock Semi-Centennial | 3 |

BY THE WAY

4

GENERAL MINING NEWS

6

SPECIAL CORRESPONDENCE

10

CONCENTRATES

15

DISCUSSION:

| | | |
|---|-------------------|----|
| Vacuum-Pump in Cyaniding..... | John S. MacArthur | 16 |
| Santa Eulalia Camp..... | Louis Lane | 16 |
| Official Definitions of Mining Terms..... | F. J. H. Merrill | 16 |
| Crucible Assays | George Doyle | 18 |
| Cost Sheet for Mines, | Frederic Irwin | 18 |

ARTICLES:

| | | |
|--|-------------------|----|
| Comstock Beginnings..... | Joseph T. Goodman | 19 |
| Discovery of the Great Comstock Mine..... | Dan De Quille | 22 |
| Mineral Deposits in Fiji..... | Whitman Symmes | 23 |
| The Comstock Mines Today..... | George A. Packard | 24 |
| Jefferson Canyon, Nevada..... | Leon M. Hall | 26 |
| Comstock Drainage Problems..... | D. D. Cairnes | 27 |
| Yukon Territory West of Lewes River..... | Percy Morgan | 29 |
| State Geological Surveys | H. E. West | 31 |
| Canadian Geological Survey | Henry G. Granger | 32 |
| Gold and Scheelite Near Macraes, New Zealand.... | | 33 |
| Account Numbers | | 34 |
| Hydraulic Dredging for Gold..... | | 35 |

DECISIONS RELATING TO MINING..... 36

EDITORIAL.

ILL goes on the free list, according to action in the Senate. The Finance Committee was voted down. It is evidently a serious matter when the insurgent movement takes Root.

MARK TWAIN was a newspaper reporter in Virginia City when times were flush along the Comstock. It was there he learned to write. The Comstock lode has yielded over three hundred and fifty million dollars in silver—and one Mark Twain. Who shall balance the scales and say which has contributed the more to the joy of the world?

GOLD continues to flow in a steady stream from the Far North. The steamer *St. Croix*, from Nome, brought \$500,000 to Seattle on June 24. The *Dolphin*, from Sitka, landed \$840,000 the same day, and the following night the *Senator*, from Nome, brought in \$250,000. Probably none the less you will need your pocketbook when you visit the 'Pay Streak' at the Exposition.

POPULAR usage had already extinguished the awkward appellation of the Cananea, Rio Yaqui & Pacific railroad on the west coast of Mexico. The child was called by its father's name, and formal acceptance is now given by the incorporation of this company, with its allied concessions, under the title of Southern Pacific Railway of Mexico. Papers were filed in New Jersey, the authorized capital being \$75,000,000, in shares of \$100 each. The length of road now controlled by this corporation is 1600 miles, extending from Nogales by way of Guaymas, Culiacán, and Tepic, to Guadalajara.

ALUMNI of the Massachusetts Institute of Technology have subscribed \$150,000 toward the cost of a new site, which it is estimated would allow for growth during a period of 50 years. The phenomenal development of this splendid institution is shown by the fact that out of 4000 graduates 75 per cent have gone forth within the last 13 years. An appeal is made for funds to erect suitable buildings in accordance with plans which call for a total outlay of \$5,000,000. The services of the Institute in the advance of technology in this country have been so great that this appeal should meet with response from every corner of the United States.

DAN DE QUILLE was the pen name of Wm. Wright, who spent sixteen varied years in Nevada at the time when many things happened in the course of a single year. In his book, 'The Great Bonanza', from which we abstract an account of the finding of the Comstock, he has presented an intimate picture of the State and its people. We have Mark Twain's word that it is accurate, and, as that

gentle philosopher has said, one gets easily a surface knowledge of any remote country through writings of travelers, but the inner life is not often presented to the reader. The outside of a strange house is interesting, but the people, the life, and the furniture inside are far more so. This week we have tried to take our readers inside the miners' cabins of fifty years ago, and these two 'newspaper reporters' of bygone years have been our guides.

NOVA SCOTIA has not received its due share of attention from the Canadian Geological Survey, according to the *Maritime Mining Record*. It puts in a vigorous plea for further work by either Dominion or Provincial officials, pointing out that the only geological reports which treat of the Province in general, are nearly a half century old. Detailed reports and special studies are of high value and must be made, but our contemporary is right in insisting that general summary reports and hand-books must be available for ready reference if the ordinary man is to be helped.

PRIOR to the enactment of the Federal Mining Law of 1866 the local regulations on the Comstock limited each locator of a claim to a length of 200 feet, and gave to the discoverer a bonus of 400 feet. From this developed the custom of association claims, in which the several locators were tenants in common. These rights were often further subdivided, so that ownership of an undivided interest in the whole claim corresponding to one foot or less in length resulted. When companies subsequently were organized, stock was issued in proportion to the footage held by each interest. At one time it was the custom to quote in feet and inches, instead of shares.

A GREAT DEAL of moisture is shipped to the smelters, that might be eliminated, and thus effect important economies. For example, many moderately argillaceous ores contain 7 per cent or more of moisture. This material when dried will not re-absorb water from the air as readily as will coal or coke. In a good dryer from seven to eight pounds of water will be driven off per pound of coal burned. If ores were dried to one per cent moisture, the elimination of 6 per cent would consume only about 17 pounds of coal per ton, and at a Western price of \$10 per ton for bituminous the cost would be less than 9 cents, plus extra labor. On the Tonopah ore and concentrate, for instance, which contain approximately 7 per cent water, the freight rate, on a valuation of \$300 per ton, is \$18; a saving of 6 per cent in that case would amount to \$1.08 per ton. The Coeur d'Alene concentrate averages about 13 per cent moisture as delivered to the smelter. The freight on this material to Colorado is \$8, and a saving of 12 per cent would reduce the cost 96 cents per ton. The so-called 'sulphurets' from the mills on the California 'Gold Belt' contain from 3 to 10 per cent moisture, and the freight to market varies, according to distance, from \$1.50 to \$6. Even here it may pay to dry the ore. In many plants enough heat is going to waste to effect this saving. The Nevada silicious ores would not benefit by such treatment. They rarely hold more than 2 per cent of moisture,

and even when the amount is higher the loss inevitable from repeated handling of high-grade gold ore must be considered; it may easily offset the saving in freight.

A CONCERTED movement has taken place at Coalinga, California, to claim, as open to location, lands to which the Southern Pacific Company holds title. The case is one which is only of interest on account of the oil reserves which are involved. In its legal aspects no new or startling decision can be expected. Ascertainment of the facts will be the chief matter. A title to lands on the public domain becomes irrevocable after the lapse of six years. The statute of limitations enacted by Congress applies that rule to all patents issuing subsequent to 1891; the limitation was fixed at five years for patents granted prior to that date. The annulment of a patent is a difficult and complicated proceeding, even when there may appear to be good warrant for it. Reasonable evidence of wilful or technical fraud must be presented to cause the Secretary of the Interior to order a hearing by the Land Commissioner. After the evidence has been taken and sifted it is subject to the joint decision of the Secretary and the Commissioner whether sufficient cause for action exist, and if an affirmative conclusion be reached the evidence and recommendation for an action by the United States is passed to the Attorney General, who also possesses certain discretionary power. The courts are always loath to set aside a patent. This is an additional safeguard to property that has arisen from universal custom, so that the locators of claims on patented lands have at best a slender chance to make good their pretensions. It must be shown that the land was wrongly classified as agricultural land, and that either fraud or error was committed. If sufficient knowledge was available when the patents issued to have shown that the lands in question were probably oil-bearing, the Department of the Interior has power to so declare, and to recommend suit to annul the titles if such action be brought within six years from the date of issue.

Nevada City Mining Exchange.

It would be matter for regret if a mining exchange were to be opened at Nevada City. The bonanzas recently discovered at Alleghany within the 'sphere of influence' of that historic mining camp, have drawn the eyes of the world again toward the district. To employ the bunco-steering mechanism of a mining exchange, as mining exchanges are usually operated, would undo the good that should accrue to the 'gold belt' through the attraction of these glittering discoveries. A few years ago Nevada City issued a sane, sensible, business-like appeal to capital through its Chamber of Commerce, insisting upon the opportunities for permanent gold mining on a large scale in Nevada county. That was legitimate advertising, and the propaganda had better be left in the hands of such a representative body of men who can be trusted not to bring reproach upon the district. The hope of the California gold-belt, both in the northern and southern portions, rests not upon extracting occasional bunches of phenomenally rich ore, but upon

large operations founded on well developed veins. The ill fame of the California quartz mines among Eastern investors is due in large part to the erection of small plants on rich but narrowly limited ore-shoots. When the streak of fat had been consumed the mass of lean could not be economically treated. The Californian deposits in the foothill region suffer under the mis-nomer of 'pocket mines'. A distinction must be drawn between the true 'pocket' of ore and the rich ore-shoot through a low-grade vein. The failures made have emphasized the need of extensive development before installing reduction works. The spirit of those whose first thought, when something good turns up, is to establish a mining exchange, does not favor conservative operation. Such men are not thinking of making mines and of creating a solid industry, but of hypnotizing the gullible public into trading in stocks. We would be glad to see an exchange that was not diverted to wrong purposes, but we are certain that the outlook for a genuine revival of mining in Nevada and Sierra counties would be seriously clouded if the projected stock-laundry should be established.

Comstock Semi-Centennial.

There is a Nemesis who deals out retribution to bluffers. By men endowed with intellectual courage no form of dishonesty is held in greater contempt. The arch bluffer who fastened his name upon the great Comstock bonanza finds no one to lament his fitting end in a suicide's grave. This marvelous silver vein, which in its influence upon history has been second only to Potosí, was actually brought to light by two unpretentious Irishmen, Peter O'Riley and Patrick McLaughlin, hard-working men, modest and easily bluffed. The episode is striking, and in some aspects picturesque. The prospectors washing the gulch for gold, following their 'pay' up the side of a canyon, suddenly came upon a black substance which yielded a pale whitish gold in fabulous amount. Then appeared that lean lank Canadian, Henry Comstock, swinging lazily on his Indian pony, pausing for an idle word, and beholding proofs of a great discovery in the bottom of the rocker. With cool impudence the renegade demanded recognition of his ownership of the land, a claim fabricated solely out of his greed, and the Irishmen, disarmed by the very audacity of the stroke, submitted. It is a story which often has been told. Less widely known is the fact that Comstock, after dropping out of sight for a time with the petty winnings which he had made—for the bluffer's genius is not gifted in following an initial advantage gained—came back, and after a brief career of popularity, posing as a mining oracle, wasted enough of his admirers' money to open their eyes to his true character.

The Comstock was a well known mining camp for years before silver was discovered in 1859. As early as 1851 there were 200 rockers at work, and the output of gold for that year reached \$60,000. The place then bore the name of Gold Canyon. The first knowledge of these silver veins is said to have been obtained by Allen and Hosea Grosh, young men of superior talents, possessed of better understand-

ing than luck. Testimony of their discovery exists in correspondence of unquestionable authenticity. Both men came to tragic ends before the fruits of their prospecting could be gathered. Their methods were characteristic of the fertility of the pioneer in expedients; to reduce the silver sulphides to metallic form they had recourse to burning the pulverized mineral in dampened gunpowder. This method of assaying, if not scientific, was at least clever. Exact information regarding their discoveries died with them, a woman who had aided them with funds being unable to indicate the position of the treasure more closely than by pointing to the side of a mountain. The romance of this greatest of all American mining camps will form material for oratory at Virginia City on July 4, when 'all Nevada', so it is claimed, will work off its enthusiasm over the fiftieth anniversary of a discovery that has added nearly \$400,000,000 to the wealth of the world.

Uncovering of the greatest bonanzas in the Lode did not come until more than twelve years after the first discovery; then followed an orgy of speculation, a frenzy that stirred the West and sent thrills across the Continent year after year for the period of a generation. This was succeeded by an epoch of shameless systematic manipulation of stocks under control of a ring that lived by clever trading on a credulous public, 'washing' stocks, earning a little money now at one mine, now at another, so as to maintain delusion, profiting through graft on the installations for pumping and milling, and on the contracts for treating the ores, while bleeding those outside the ring by 'Irish dividends'. This infamy is practically ended. A new era has dawned, when legitimate work by honest and capable men is being done.

The Comstock has presented many problems of mining, milling, and finance, and many famous names are associated with it. Clarence King, G. F. Becker, John Church, Ferdinand von Richthofen, and other great geologists have studied the lode and made their contribution. Of these perhaps von Richthofen saw farthest; at least his predictions as to the position of the orebodies have been singularly verified. It was on the Comstock that square-setting as a method of holding ground was first employed on a large scale. It was here that the Washoe process of pan-amalgamation was developed from the slow patio method. It was in the Sutro that many problems in tunnel-driving were worked out, and it was on the Comstock that pumping large quantities of hot water from great depths was first accomplished. In the end the water won, and the miners were temporarily driven out, but now the solution of the problems of drainage seems to have been found, and deep mining will be a feature of the new development.

Elsewhere in this issue we print articles by men who tell of the Comstock from intimate knowledge, Mr. Joseph T. Goodman from the standpoint of a pioneer as the editor of the *Territorial Enterprise* in Virginia City for many years, beginning in 1861; Mr. Leon M. Hall, a distinguished engineer, born on the Comstock, to which he has devoted his life; and Mr. Whitman Symmes, another of the brilliant young engineers, entrusted with responsibility for the work of redeeming the name and fame of the historic camp.

BY THE WAY.

Mark Twain, in his famous book entitled 'Roughing It', first published in 1872, tells of 'flush times' in Silverland. Virginia, he says, came to be the 'livest' town, for its age and population, that America had ever produced. The sidewalks swarmed with people—to such an extent, indeed, that it was generally no easy matter to stem the human tide. The streets themselves were just as crowded with quartz wagons, freight teams, and other vehicles. The procession was endless. So great was the pack that buggies frequently had to wait half an hour for an opportunity to cross the principal street. Joy sat on every countenance, and there was a glad, almost fierce, intensity in every eye, that told of the money-getting schemes that were seething in every brain and the high hope that held sway in every heart. Money was as plenty as dust; every individual considered himself wealthy, and a melancholy countenance was nowhere to be seen. There were military companies, fire companies, brass bands,



SELLING A MINE.

Reproduced from 'Roughing It'.

banks, hotels, theatres, 'hurdy-gurdy houses', wide-open gambling palaces, political pow-wows, civic processions, street fights, murders, inquests, riots, a whiskey mill every fifteen steps, a Board of Aldermen, a Mayor, a City Surveyor, a City Engineer, a Chief of the Fire Department, with First, Second, and Third Assistants, a Chief of Police, City Marshal and a large police force, two Boards of Mining Brokers, a dozen breweries, and half a dozen jails and station-houses in full operation, and some talk of building a church. The 'flush times' were in magnificent flower! Large fire-proof brick buildings were going up in the principal streets, and the wooden suburbs were spreading out in all directions. Town lots soared up to prices that were amazing.

The great 'Comstock Lode' stretched its opulent length straight through the town from north to south, and every mine on it was in diligent process of development. One of these mines alone employed six hundred and seventy-five men, and in the matter

of elections the adage was, "as the 'Gould and Curry' goes, so goes the city." Laboring men's wages were four and six dollars a day, and they worked in three 'shifts' or gangs, and the blasting and picking and shoveling went on without ceasing, night and day.

The 'city' of Virginia roosted royally midway up the steep side of Mount Davidson, 7200 ft. above the level of the sea, and in the clear Nevada atmosphere was visible from a distance of fifty miles! It claimed a population of fifteen to eighteen thousand, and all day long half of this little army swarmed the streets like bees and the other half swarmed among the drifts and tunnels of the 'Comstock', hundreds of feet down in the earth directly under those same streets. Often we felt our chairs jar, and heard the faint boom of a blast down in the bowels of the earth under the office.

The mountain side was so steep that the entire town had a slant to it like a roof. Each street was a terrace, and from each to the next street below the descent was forty or fifty feet. The fronts of the houses were level with the street they faced, but their rear first floors were propped on lofty stilts; a man could stand at a rear first-floor window of a C street house and look down the chimneys of the row of houses below him facing D street. It was a laborious climb, in that thin atmosphere, to ascend from D to A street, and you were panting and out of breath when you got there; but you could turn and go down again like a house a-fire—so to speak. The atmosphere was so rarified, on account of the great altitude, that one's blood lay near the surface always, and the scratch of a pin was a disaster worth worrying about, for the chances were that a grievous erysipelas would ensue. But to offset this, the thin atmosphere seemed to carry healing to gunshot wounds, and therefore, to simply shoot your adversary through both lungs was a thing not likely to afford you any permanent satisfaction, for he would be nearly certain to be around looking for you within the month, and not with an opera-glass, either.

From Virginia's airy situation one could look over a vast, far-reaching panorama of mountain ranges and deserts; and whether the day was bright or overcast, whether the sun was rising or setting, or flaming in the zenith, or whether night and the moon held sway, the spectacle was always impressive and beautiful. Over your head Mount Davidson lifted its gray dome, and before and below you a rugged canyon clove the battlemented hills, making a sombre gateway through which a soft-tinted desert was glimpsed, with the silver thread of a river winding through it, bordered with trees which many miles of distance diminished to a delicate fringe; and still farther away the snowy mountains rose up and stretched their long barrier to the filmy horizon—far enough beyond a lake that burned in the desert like a fallen sun, though that, itself, lay fifty miles removed. Look from your window where you would, there was fascination in the picture. At rare intervals—but very rare—there were clouds in our skies, and then the setting sun would gild and flush and glorify this mighty expanse of scenery with a bewildering pomp of color that held the eye like a spell and moved the spirit like music.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. S. NOYES is at Denver.

J. E. SPURR is at Kofa, Arizona.

LESTER W. STRAUSS is at Lima, Peru.

FRED. W. BRADLEY is in the Coeur d'Alene.

RALPH ARNOLD has been in San Francisco.

R. S. BOTSFORD has left England for Brazil.

J. L. MAKEEVER was in San Francisco recently.

HOWARD D. SMITH has returned to San Francisco.

T. H. LEGGETT has returned to New York from Mexico.

R. CHESTER TURNER has returned to Berkeley from Mexico.

C. W. HAYES is visiting the oilfields of southern California.

A. A. STEEL is studying the Bingham Canyon mines, in Utah.

H. W. TURNER has returned to San Francisco from Prince Rupert.

LEONARD SIVYER has been examining mines near Clifton, Arizona.

FRED E. WRIGHT was married at Montreal, Canada, on June 16.

FRANK J. BOOTH has gone to San Juan Nepumceno, near Chihuahua.

E. S. PETTIS has left Costa Rica, Central America, for Mill Valley, California.

GEORGE CLARK GESTER has opened an office at 425 Washington street, San Francisco.

J. F. KEMP and a party of students have been working near Pottsville, Pennsylvania.

A. H. BROOKS sailed from Seattle for Cordova, Alaska, on the steamer *Northwestern*, July 1.

THEODORE GROSS, who represents the London Venture Corporation and the Hirsch Syndicate in New York, has gone to London.

ROBERT ANDERSON is completing the geological survey of the oilfields in the Carriso plain of San Luis Obispo county, begun by Ralph Arnold.

Latest Market Reports.

| LOCAL METAL PRICES. | | | |
|------------------------|------------|---------------------|---------|
| San Francisco, July 1. | | | |
| Antimony | 12-12½c | Quicksilver (flask) | 44-45 |
| Electrolytic Copper | 15½-16½c | Spelter | 6½-7½c |
| Pig Lead | 4.60-5.55c | Tin | 32-33½c |

| ANGLO-AMERICAN SHARES. | | | |
|------------------------|----------|---------|-------|
| Cabled from London. | | | |
| | June 24. | July 1. | |
| | £ s. d. | £ | s. d. |
| Camp Bird | 1 8 6 | 1 | 8 6 |
| El Oro | 1 6 3 | 1 | 6 3 |
| Esperanza | 2 16 3 | 2 | 15 9 |
| Dolores | 1 10 0 | 1 | 10 0 |
| Oroville Dredging | 0 13 6 | 0 | 13 6 |
| Mexico Mines | 6 16 3 | 6 | 3 9 |
| Tomboy | 1 2 6 | 1 | 2 6 |

| COPPER SHARES—BOSTON. | | | |
|-----------------------|-----|----------------------|-----|
| Closing Prices. | | Closing Prices. | |
| July 1. | | July 1. | |
| Adventure | 7 | Mohawk | 64½ |
| Allouez | 42½ | North Butte | 50½ |
| Arcadian | 4 | Old Dominion | 53½ |
| Atlantic | 9 | Oaxaca | 176 |
| Calumet & Arizona | 104 | Parrot | 80½ |
| Calumet & Hecla | 655 | Santa Fe | 2½ |
| Centennial | 32 | Shannon | 15½ |
| Copper Range | 81½ | Superior & Pittsburg | 15 |
| Daly-West | 7½ | Tamarack | 71 |
| Franklin | 17½ | Trinity | 11½ |
| Granby | 100 | United Copper Con. | 10 |
| Greene-Cananea, etc. | 10 | Utah Con | 42 |
| Isle Royale | 25 | Victoria | 4½ |
| La Salle | 12½ | Winona | 6 |
| Mass | 8½ | Wolverine | 149 |

(By courtesy of J. C. Wilson, Mills Building.)

| METAL PRICES. | | | | |
|--|----------------------|------------|----------|-----------------|
| By wire from New York. | | | | |
| Average daily prices in cents per pound. | | | | |
| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
| June 25 | 13.07 | 4.35 | 5.45 | 52¼ |
| " 26 | 13.07 | 4.35 | 5.45 | 52¼ |
| " 27 | Sunday. | No market. | | |
| " 28 | 13.07 | 4.35 | 5.45 | 52¾ |
| " 29 | 13.00 | 4.35 | 5.45 | 52 |
| " 30 | 13.00 | 4.35 | 5.45 | 52¾ |
| July 1 | 13.00 | 4.35 | 5.45 | 51¾ |

| MINING QUOTATIONS—NEW YORK. | | | |
|---------------------------------|----------|-----------------|---------|
| | June 24. | Closing Prices. | July 1. |
| Amalgamated Copper | 82½ | 82½ | 82½ |
| American Smelting & Refining Co | 91¼ | 92½ | 92½ |
| Boston Copper | 14½ | 15 | 15 |
| Butte Coalition | 25¼ | 26¼ | 26¼ |
| Cumberland-Ely | 8 | 8 | 8 |
| Dolores | 5 | 5 | 5 |
| El Rayo | 2 | 2 | 2 |
| Giroux | 7½ | 7½ | 7½ |
| Greene-Cananea | 10¼ | 10 | 10 |
| Indiana Sonora | 3½ | 3 | 3 |
| La Rose | 8 | 8½ | 8½ |
| Miami Copper | 16½ | 15½ | 15½ |
| Nevada Consolidated | 23½ | 23½ | 23½ |
| Newhouse | 1½ | 1½ | 1½ |
| Nipissing | 10½ | 10½ | 10½ |
| Ohio Copper | 4½ | 4½ | 4½ |
| Tennessee Copper | 39 | 38 | 38 |
| Utah Copper | 49 | 48½ | 48½ |
| Yukon | 4½ | 4½ | 4½ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

| SOUTHERN NEVADA STOCKS. | | | |
|-----------------------------|-------|----------------------------|------|
| San Francisco, July 1. | | | |
| Atlanta | \$ 11 | Mayflower | \$ 9 |
| Belmont | 90 | Midway | 22 |
| Booth | 12 | Montana Tonopah | 68 |
| Columbia Mtn | 10 | Nevada Hills | 15 |
| Combination Fraction | 58 | Ophir (Comstock) | 1.45 |
| Daley | 24 | Pittsburg Silver Peak | 48 |
| Fairview Eagle | 18 | Rawhide Coalition | 25 |
| Florence | 3.00 | Rawhide Queen | 38 |
| Goldfield Con. (ex div 30c) | 7.20 | Round Mountain | 71 |
| Gold Keweenaw | 8 | Sandstorm | 10 |
| Great Bend | 6 | Silver Pick | 11 |
| Jim Butler | 10 | St. Ives | 10 |
| Jumbo Extension | 11 | Tonopah Extension | 50 |
| Llanos Con. | 75 | Tonopah of Nevada (xd 35c) | 7.50 |
| Mac Namara | 28 | West End | 23 |

| COMSTOCK QUOTATIONS. | | | |
|-------------------------|----------|------------|--|
| San Francisco, June 30. | | | |
| | Bld | | |
| | Morning. | Afternoon. | |
| Alpha | 2 | 2 | |
| Alta | 3 | 3 | |
| Andes | 14 | 14 | |
| Belcher | 46 | 45 | |
| B. & Belcher | 37 | 37 | |
| Bullion | | 15 | |
| Caledonia | 18 | 20 | |
| Challenge Consolidated | 18 | 19 | |
| Chollar | 19 | 20 | |
| Confidence | 80 | 80 | |
| Consolidated Imperial | 2 | 2 | |
| Consolidated Virginia | 85 | 84 | |
| Crown Point | 40 | 44 | |
| East S. Nevada | | | |
| Eschequer | 25 | 25 | |
| Gould & Curry | 18 | 19 | |
| Hale & Norcross | 22 | 22 | |
| Julia | 4 | 4 | |
| Justice | | 1 | |
| Kentuck | 6 | 6 | |
| Lady Washington | | | |
| Mexican | | 100 | |
| New York Consolidated | | | |
| N. Gould & Curry | | | |
| Occidental | 15 | 15 | |
| Ophir | 140 | 142 | |
| Overland | | | |
| Overman | 29 | 30 | |
| Potosi | 24 | 26 | |
| Rich-Eureka | | | |
| Savage | 20 | 20 | |
| Scorpion | 6 | 6 | |
| Seg. Belcher | 3 | 3 | |
| Sierra Nevada | 28 | 28 | |
| Silver Hill | 8 | 8 | |
| St. Louis | | | |
| Syndicate | | | |
| Union | 45 | 46 | |
| Utah | 4 | 4 | |
| Yellow Jacket | 50 | 53 | |

(By Courtesy of W. C. Ralston.)

General Mining News.

ALASKA.

The Manley holdings in the Hot Springs district have been leased to Tom Aitken.—A test lot of 1000 tons of ore from the Delos Fraber vein above Cleary was run through the mill at Fairbanks. The ore was taken out at a depth of 20 ft. and milled about \$40 per ton.—The first shipment of gold in the registered mail from the Tanana district amounted to over \$1,000,000.

ARIZONA.

COCHISE COUNTY.

B. Q. Musgrove and associates have a lease and bond on the Paradise holdings of F. G. Bernondy and W. P. Wright.—W. L. Masters shipped 90 sacks of silver ore from the Treasure Hill mine to the smelter at El Paso.—T. E. O'Brien has taken a lease on the Bunker Hill mine near Cerbat.—The property of the North Bisbee Development Co. in Dixie canyon has been transferred to the Bisbee Coalition Co.—Cross-cuts from the 1500-ft. level of the Junction shaft of the Superior & Pittsburg have opened good ore-bodies.—The Copper Queen is carrying on a number of experiments, using steel and concrete reinforced by ½-in. iron bars as a substitute for mine timbers.

GILA COUNTY.

The Arizona Commercial Co. is confining the development work to the 700-ft. level of the Eureka shaft.—The Old Dominion Copper Co. has contracted to supply the Miami company with 1,000,000 gal. of water per day.—Plans are under way for the construction of a mill for the Miami Copper Co. having an initial capacity of 2000 tons, which will be afterward raised to 3000 tons per day.—The adit to intersect the vertical shaft of the Live Oak Copper Co. is in about 1000 ft. and has cut 150 ft. of concentrating ore.—On a car of ore shipped from the Copper & Silver Zone mine the return was 93 oz. silver and 2% copper. H. W. Clark is in charge of the work.

PINAL COUNTY.

The Ray Consolidated Copper Co. has let a contract for 4000 tons of structural steel to the Kansas City Structural Steel Co. The steel is to be delivered in Kelvin this fall to be used in the erection of the 5000-ton concentrator and smelter. The Ray company has also let a large contract for heavy timber and lumber to be used in the construction of the big mill.

YAVAPAI COUNTY.

Work is to be resumed on the Alvarado mines at Fools' gulch. A Butters filter will be installed.—The 200-ft. shaft of the Champion group on Lynx creek is being unwatered. John Edwards is superintendent.—The Goldsworthy placer ground on Lower Lynx creek has been taken over by Wilbur Treadwell.

CALIFORNIA.

FRESNO COUNTY.

A surveying party under the direction of C. P. Bowie has begun staking the route of the new Associated pipeline from Coalinga to Port Costa. It will run direct to Tracy, thence to the bay parallel with the Bakersfield line.—W. W. Sweet, who held an option on the property of the West Coalinga Oil Co., has bought the property for \$42,000. It comprises 57¼ acres.

INYO COUNTY.

(Special Correspondence).—The Skidoo mine is producing at the rate of \$24,000 per month. During May 824 tons were treated. The bullion extraction was \$20,473 and cyanide extraction \$1000. Development and operation costs amounted to \$6,404.91, leaving a net profit of \$15,417.46.—The Conklin Mining Co. has installed a 10-stamp mill and 7000-ft. tramway at its Monster property. A wagon-road has also been built from the mine to Brown station on the California & Nevada railway. Large reserves of ore have been opened and prospects are good for a steady production.

—The King lease has opened a vein of free-milling ore on the estate of the Inyo Mines Syndicate at Benton.—Mount & Denison are sinking on a 5-ft. vein of \$7 ore.—The Shive-Untank lease at Chedago has developed a 3-ft. vein of excellent ore at a depth of 125 ft.—The Lucky Jim is sacking ore for shipment to the Keeler smelter.—In the Bishop district most of the old properties are working steadily. Lack of ample finances is holding back rapid developments in some cases, but this feature is manifesting encouraging improvement.

Bishop, June 26.

A cloudburst in the mountains surrounding Bishop has caused the destruction of the diverting dams of the Nevada-California Power Co., causing the shut-down of many mines throughout Nevada. The company has three plants at Bishop operated by water-power. Two of these were completely closed and the third badly damaged.

MONO COUNTY.

(Special Correspondence).—Surveyors are mapping out a route for a railway from Gardnerville to Bodie, which will pass directly through the Masonic district. This will enable the various companies to ship their higher grades of ore to the smelters and devote their attention to milling their immense deposits of low-grade quartz. The Pittsburg Liberty, the largest property in the camp, is producing \$25,000 per month. Ten stamps and a cyanide plant are in commission.—At the Golden Cycle the shaft is down 110 ft., with a 4-ft. vein of ore assaying over \$40 per ton at the 83-ft. level. The north drift has cut a 7-ft. vein said to run more than \$25 per ton.—Lessees on the Snowdrift have opened a strong body of ore assaying \$25 per ton.—At the Casa Diablo, drifts are being driven from the 100-ft. level to cut several veins opened higher up. The mill is running steadily and two bars of bullion are shipped each month.

Masonic, June 28.

NEVADA COUNTY.

The shaft at the Union Hill mine below Grass Valley will be sunk from the 600 to the 650-ft. level and a cross-cut run to the vein. A Cornish plunger pump with a capacity of 1200 gal. per minute has been ordered by the company.—In the 150-ft. drift from the 900-ft. level of the Oustomah a shoot of ore has been cut that assays from \$250 to \$500 per ton. E. H. Wilson is manager.

PLACER COUNTY.

Charles Peach has purchased the C. A. Reed quartz mill near Lozano's in the Ophir mining district.

SACRAMENTO COUNTY.

Clinton L. White, Mayor of Sacramento, has called a meeting of representative citizens of the cities of that district to consider means of regulating the work of dredges.

SAN BERNARDINO COUNTY.

(Special Correspondence).—A 16-in. streak of bonanza ore has been cut at a depth of 185 ft. in the Ram's Horn at Silver Lake. Samples of the ore assay \$3000 per ton. The adit is in 180 ft. in milling ore.—Ore assaying from \$5 to \$90 per ton has been struck in the shaft at the Avawatz, and at the 65-ft. level a 3-ft. body of fair-grade ore is being opened. C. S. Eichholtz is superintendent.—The adit at the Old Glory is in 180 ft. and some milling ore has been opened. F. M. Myrick is superintendent.—The shaft at the Eaton group at Seventeen Mile Point is being sunk from the 200 to the 300-ft. level and is opening bodies of milling ore. John L. Witney is manager.—The Todhunter-Felix lease at Hart has cut the southern end of the rich shoot exposed in the shaft. It is 18 in. wide and assays about \$50 per ton.—The Crackerjack Bonanza is driving a cross-cut from the 200-ft. level of the main shaft and is in 70 ft. Three thousand tons of ore assaying \$5 to \$80 per ton are stored on the dump. F. L. Flourman is manager.—Providence, Rhode Island, people have purchased the Oro Belle Extension, Oro Extension, Oro No. 1 Extension, Ruth, Ruth Extension, Red Boy, Red Boy Fraction, and Estrella claims and have started vigorous work. Three shafts are going down at the Ruth, Red Boy, and Oro Extension.—C. A. Leager and S. T. Grant, of Goldfield, have acquired 10 claims

at Shadow mountain and are pushing work. The vein is 3 ft. wide and carries gold and copper.—The Alta mine is shipping ore to Selby.

San Bernardino, June 25.

SHASTA COUNTY.

The Uncle Sam mine above Kennett has been purchased from Fred H. Dakin by I. O. Jillson and A. L. McIntosh.—The iron smelter at Heroult has closed down temporarily for repairs. These will take about three months and the smelter will commence commercial operations this fall.

SIERRA COUNTY.

The American Mining & Development Co., operating a drift gravel mine at Snowdon Hill, seven miles above Camp-tonville, has just completed the work of installing a three-drill Sullivan air-compressor and an electric lighting plant. One machine-drill is now running in the bedrock adit, and one at the 250-ft. station where a cross-cut is being driven across the channel. The plant is operated by water-power. Pay-gravel has recently been found and the construction of a sluice for washing the gravel is under way. Roy G. Mead is manager.—Henry C. McPike, a San Francisco attorney, has been appointed receiver for the famous Sixteen-to-One and Bonanza King mines in Alleghany, in the suit brought in San Francisco by M. Vander Beugle. The latter demands an accounting of all moneys and ore received by E. H. Wilson since their partnership.—The adit of the Twenty-One mine at Alleghany cut the vein and opened an orebody carrying a high percentage of arsenical sulphide. F. M. Phelps and associates are operating the mine.

SISKIYOU COUNTY.

The Welsh mine on Grouse creek is running three giants and one hydraulic elevator.—The mill of J. M. Morrison in Quartz valley has been started.—The Phillips brothers cleaned up 100 oz. of gold from the last run of the Saint George placer near Hawkinsville.—It is reported that the Blue Ledge Copper Co. is to build a railroad and smelter.—The Zarina Mining Co., which is operating the Taylor Lake mine on Taylor creek, is moving its mill and expects to have 10 stamps in operation within another month.—The Boundary mine on south fork of Scott river has begun operations, and has a crew of men laying the pipe-line and cleaning out the ditches and repairing flumes.

COLORADO.

BRECKENRIDGE COUNTY.

The Puzzle and Ouray properties are being re-opened and the mill put in working order. W. T. Hayes is in charge of the work.

CLEAR CREEK COUNTY.

(Special Correspondence).—R. B. Morton, operating the Commodore property on Red Elephant mountain, has commenced shipping smelting ore. Stoping is in progress upon a body of mineral that is from 18 in. to 2 ft. wide, and from returns the ore has been found to contain on an average of 190 oz. in silver per ton.—Noonan & Oxley have taken a lease upon the upper dump of the Lamartine mine. There is estimated to be 50,000 tons of this stuff, all of which is to be hauled to the Jackson mill at Idaho Springs for concentration. During the early history of operations no ore was marketed that carried less than \$60 per ton, and as a result the dump will probably average more than \$20 per ton.—J. G. Roberts, who constructed a 100-ton rough-jigging plant at the lower dumps of the Lamartine, is operating the plant with two 12-hour shifts. The product, after treatment, is hauled to the Jackson mill at Idaho Springs for the separation of the lead, zinc, and iron.—The water from the Seven-Thirty shaft on Sherman mountain was struck last Saturday, and the old workings are now gradually draining themselves. For some time 10-ft. holes had been kept ahead of the shooting to avoid any danger. Owing to the great pressure from above no one will be allowed to enter the Burleigh workings, as it is feared by the manager, J. H. Robeson, that the ground may give way suddenly, allowing a deluge of water to make its escape. As near as known there are between 7 and 10 miles of underground workings, all of which are filled with

water from the third level down to the seventh.—John L. Malm, inventor of the Malm process of chemical-electro ore extraction, and G. J. Bancroft examined the East Griffith mine on Griffith mountain, and it is reported that at an early date work will be put under way upon a 50-ton plant for the treatment of the ore found in the various workings of that property. The East Griffith has large reserves of lead-zinc ore, which assays high in gold and silver, and it is claimed by Mr. Malm that this ore is adaptable to his method of treatment. D. W. Hoover, of Denver, is manager. Georgetown, June 23.

OURAY COUNTY.

John Keleher shipped two cars of ore from his lease on the Neodesha mine.

GUNNISON COUNTY.

The 426-ft. raise from the adit level of the Blistered Horn mine near Tincup is completed. A. Lejune, the manager, expects to have the mill running some time this summer.—The Gold Links mine is preparing to install a hydro-electro plant. Richard Kilvert is superintendent.—Teams are hauling ore from the Morning Star mine to Sargent. John C. Reagan is in charge of the work.

SAN MIGUEL COUNTY.

The property of the Ophir Consolidated Mining Co. of Ophir was sold to the Milwaukee Trust Co. for \$335,988 at a trustees' sale. The property was closed by the bondholders.

SAN JUAN COUNTY.

The Highland Mary mine is shipping ore regularly to the Durango smelter. George Hill is superintendent.—The concentrate from the trial run of the Arpad assayed 5 oz. gold, 28 oz. silver, and 68% lead. William Harrison is in charge of the work.

SUMMIT COUNTY.

The Hoosier Gulch Co. will work the Bemrose placer at the head of the Blue river this summer. J. F. Lincoln is manager.—The Relling dredge at the Mekka placer east of Breckenridge took out \$13,000 in one week.

TELLER COUNTY.

The connection has been made between the south heading of the International shaft of the Roosevelt tunnel with the Portal heading. The alignment and grade are exact. Measurements taken from the records of the engineer show the total distance covered in the two headings to be 7975 ft. In addition, the north heading from the Intermediate shaft has been carried 1875 ft., a total distance for all three headings of 9850 ft. Work was started on the tunnel May 11, 1907.—A Franklin electric 10-drill compressor has been purchased by the Doctor Jack Pot Mining Co. and will be installed at the Davenport shaft. A. E. Carlton is president.—The Gold Issue Mining Co. is installing an aerial tram by which ore is to be transported from the Midget mine on Gold hill to the Gold Issue mill on the northwestern slope of Carbonate hill, about two miles distant.—The Elkton Mining & Milling Co. has declared the regular bi-monthly dividend of 1¼c. per share.—The shoot on the No. 3 south vein of the Victor Consolidated Gold Mining Co. has been cut on the 1300-ft. level. Average samples assayed about \$165 per ton.

IDAHO.

IDAHO COUNTY.

The Jennings Dredging Co., of New York City, has closed a contract with the Hammond Manufacturing Co., of Portland, Oregon, for the construction of a gold-mining dredge to be installed on its property on Little Elk creek, the specifications calling for a dredge having a capacity of 2000 cu. yd. per day and be ready for delivery by September 15.—A 4-ft. vein of rich ore was cut on the Center Star group owned by James Murphy, Herman Brown, and Charles Tiedeman.

OWYHEE COUNTY.

A consignment of electric machinery has been received by the Silver City Mining & Milling Co. J. F. Cook is manager.

SHOSHONE COUNTY.

A decision has been rendered in favor of the Tamarack & Chesapeake, against the Snow Peak M. Co.—The adit of the Great Northern M. Co. east of Burke is in 400 ft., the last 30 being in chlorides that assay 14 oz. silver per ton. Ed. Eisman is manager.—The mill on the Granite-Allie property near Murray is being overhauled. The company will commence shipping its high-grade lead-silver ore at an early date.—Report of the Copper King Mining & Smelting Co. of Mullan, issued to the stockholders, shows that 1007 ft. of adit has been run since December 15, at an average cost of \$9.54 per foot, making a total of 1107 ft. The directors have authorized an assessment of 1c. per share on the capital stock.—The Federal Mining & Smelting Co. paid a dividend of 1¼% on the preferred stock recently. The disbursement amounts to \$210,000.—The Gold Back mine near Murray has been bonded by the Duluth Development Co. and a double-compartment shaft started.—Ore assaying \$2200 per ton has been cut on the property of A. B. Rhude.—The Alice Mining Co. has bought the Milwaukee Mining Co.'s 100-ton mill on the Formosa property near Gem, and will ship it to the Alice mine.—The 700-ft. adit of the Coeur d'Alene Central cut a vein that assays 26 oz. silver and 1% lead.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—Wilcox & Co. have just finished three holes in the grayish flint deposit north of Galena, finding ore from 165 to 220 ft., the cuttings running from 15 to 18% zinc.—The Old Happy Hollow tract south-east of Galena has been bought by Decker & Co., of Joplin.—The Clermont company has bought the Kathleen mill in the Zincite camp and will re-erect it.

Galena, June 28.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The Integrity Mining Co. on the Carter land north of Webb City is re-building the mill which was burned last year. The new plant will be a 250-ton structure.—The new mill on the Ave Maria lease in the new sheet-ore field south of Webb City has been put into commission and the first turn-in has been made.—The Grace Ping Co. has put up a new concentrating plant of 150 tons at Duenweg.—The Cock Robin Co., in the Chitwood camp, has put up a new 200-ton mill which has been running successfully about three weeks.—The Red Dog mine in North Webb City has installed a 200-hp. electric plant.—The Barfet Mining Co., operating in Turkey Creek valley north of Joplin, has struck a rich lead deposit.—A good drill-strike has recently been made on the Shiffer-decker land west of Joplin by J. E. Stillwell.

Joplin, June 29.

MONTANA.

MISSOULA COUNTY.

The Success Mining Co., which holds an option on the controlling interest of the Monitor mine, has commenced to unwater that property under the supervision of J. Leslie Bailor.

SILVER BOW COUNTY.

A consignment of dredging machinery has been purchased by M. H. De Hora, manager for the British Butte Mining Co., from the Risdon Iron Works of San Francisco.

NEVADA.

ELKO COUNTY.

John R. Pattison has completed his mill and commenced to work the dump of the old Navajo mine at Tuscarora. The Navajo was never opened below the 600-ft. level, but is credited with a production of \$7,000,000.—E. A. P. Johnson, P. C. Johnson, R. T. Noble, and W. D. Bray have purchased the Young lease on the placer properties of the Nevada Hydraulic Mining & Milling Co. and have equipped them with a complete hydraulic plant.

ESMERALDA COUNTY.

The Hubbard lease in the Luckyboy district is shipping 75 to 80 tons of ore per day.—The shaft of the Spencer

lease is down 300 ft. and shipping will commence this month.—A hoist is being installed on the McAfee lease.—A shoot of high-grade ore was cut on the McCormick lease while cutting the station at the 100-ft. level. Thomas G. Murphy is in charge of the work.—The Red Top Mining & Leasing Co. is carrying on development work from the 575-ft. level.—The Golden Daisy at Diamondfield cut an 8-in. vein that assayed \$120 per ton in gold and silver. H. A. Morrison is operating the property.—There are 12 tons of ore that will assay between \$200 and \$250 per ton ready for shipment at the St. Ives lease. A. A. Codd is manager.—The shaft of the Railroad lease on the Conservative property is down 145 ft.—J. A. Burton is to start work on the Montezuma Gold King property north of Montezuma.

HUMBOLDT COUNTY.

The raise from the 425-ft. level of the Wihuja lease in the Seven Troughs district is in good ore. As soon as this shoot is opened the ore will run through the Coalition mill.

LINCOLN COUNTY.

The Oregon-Pioche Mining Co. is to resume operations on its mine in the Highland district.—C. Hunsaker has sold his interest, 37,500 shares, in the Occidental Mining Co. of Eldorado to C. G. Austin and Buffalo associates. E. P. Jeanes will be superintendent.—The drift on the vein of the Lenape mine cut an excellent shoot of copper ore. The shaft is to be sunk to the 300-ft. level and lateral work carried forward from that point.

NYE COUNTY.

(Special Correspondence).—The placers are continuing to show up well, and in many cases are exceeding earlier expectations. In the main gulch, west of the camp, approximately 160 shafts have been sunk and the gold zone demonstrated for six miles. The channel in some places is 700 ft. wide, but will probably average about 300 ft. The gravel-beds range from 3 to 5 ft. thick at bedrock, the depth varying from 40 ft. near the camp to 100 at the edge of Smoky valley. Operators state that the value is about \$12 per yard of washed gravel, while the cost of handling and treating is \$2 to \$4 per cubic yard. With the coming of the electric-power supply from the Nevada-California Power Co. it is expected that this cost will be materially reduced. Several placer claims have changed hands recently, and the excitement manifests no sign of abating.—The Murdock Placer Co. has secured the Bright August lease on the main gulch for \$4000 and will install an electric hoist and other machinery in order to carry on extensive work. Loftus & Davis are interested. The company is also operating several other claims.—A 2-ft. body of \$60 ore has been opened at a depth of 325 ft. in the Plamenaz Union No. 9, and is showing increasing strength with development. About 4 in. runs into high-grade shipping ore.—The Irvine lease on Broncho has cut a shoot of ore said to average \$45 per ton at a depth of 15 ft. The shaft is going down steadily.—A 3-ft. vein of ore running \$20 to \$30 per ton has been cut at a depth of 125 ft. in the Morning Star.—At the Toyahe a 4-ft. body of \$20 quartz has been struck. Two leases are being worked in addition to the parent company. The ore occurs in porphyry.—At the Manhattan Consolidated developments are going forward with machine-drills. It is said that fair-grade ore is being found. The property is equipped with a 50-hp. hoist and air-compressor.—A suction dredge will shortly be installed on the September claim in the main placer gulch.

Manhattan, June 28.

The first lease to start work in the Ellendale district is owned by N. B. Phillips on Jim Clifford's ground.—The Keane Wonder at Bullfrog shipped 8 bars of bullion worth \$22,000.—The last shipment of Tramp ore from the Clothier-Gingles lease to the smelter at Needles was settled for on the basis of \$95 per ton.—The regular dividend of 25c. per share and an extra dividend of 10c. per share has been declared for July 21 by the Tonopah Mining company.—Work on the north cross-cut on the 765-ft. level of the Montana-Tonopah is to be rushed, as this is prospecting new ground. The west drift on the 390-ft. level is following the Triangle vein, which averages from 2 to 3 ft. of milling

ore.—The West End Consolidated is shipping about 85 tons of ore per week to the smelter. Fred Corkill is superintendent.—A new 10-drill compressor, motor, and transformer has been installed at the MacNamara mine.—The Belmont has commenced sinking from the 1100 to the 1200-ft. level.—At the Montgomery-Shoshone ore is being stoped on the third and fifth level. A new Chilean mill is to be installed shortly, the concrete base of which is already completed.—The Crystal Bullfrog custom mill has commenced operations and the cyanide plant will be ready to start about the 15th of this month. The mill is equipped with three single stamps. The first ore run was that of the Bowen lease on the Denver claim. It averaged about \$50 per ton.—Lateral work has been started from the 123-ft. level of the Indiana.

OREGON.

GRANT COUNTY.

The Independence mine in the Granite district is being unwatered. Walter G. Gleeson is manager.

JOSEPHINE COUNTY.

A water-power plant is being installed at the Oriole mine. J. C. Mattison is manager.—A new mill is being erected at the Sugar Pine mine.

UTAH.

BEAVER COUNTY.

The shaft of the Cupric Mines Co. cut shipping ore at a depth of 300 ft.—The Cave mine is shipping one car of copper ore per day.—A body of copper ore was cut by the shaft of the Majestic mine at a depth of 360 ft.—The Horn Silver Mining Co. sent a carload of ore to Salt Lake to ascertain if it could be worked by the Behrend system of dry concentration. M. C. Morris is manager.

JUAB COUNTY.

The Lehl Tintic mine shipped 25 tons of lead-silver ore to the Tintic smelter that assayed 56% lead and 25 oz. silver per ton. Theodore Nichols is superintendent.—A cross-cut has been started from the 300-ft. level of the Provo property.—Higgenson & Baxter shipped a car of ore from their lease on the La Clède mine.—A new hoisting plant has been placed at the Gruttl shaft.—The first shipment of ore from the Chief Consolidated Mining Co. was sent to the Tintic smelter June 25. Walter Fitch is manager.—The Montana mine is sinking a three-compartment shaft.—The old Gold Blossom mine is being re-opened.

SUMMIT COUNTY.

Work will be resumed on the Nelson Queen mine east of Park City as soon as electric power can be brought to the mine.—A new orebody has been opened in the old Carbonate Hill mine and shipping will be resumed.

TOOELE COUNTY.

The first shipment of ore for the current season from the property at Ophir of the Lion Hill Consolidated Co. was settled for on June 23 by local smelting companies. The shipment consisted of one car, which was divided into two lots. Lot No. 1 assayed: gold 0.26 oz., silver 581.6 oz., and lead, 15.5%. Lot No. 2 assayed: gold 0.309 oz., silver 235.2 oz., and lead 9.7%. George St. Clair is manager.

WASHINGTON.

STEVENS COUNTY.

Conrad Wolfe, manager of the United Copper Co., near Chewelah, has begun work on a spur six miles from Chewelah to a point near the portal of the tunnel, now being driven to tap the vein.

CANADA.

ONTARIO.

The Empire mine is to sink to the 200 and cross-cut at the 155-ft. level.—The Silver Cross mine at Cross lake has been sold to Pittsburg capitalists. W. H. Jeffery is now manager.—The Temiskaming & Hudson Bay Co. has declared a dividend of \$5 per share on the old capitalization.—The shaft of the Gifford Extension in the Coleman district is down 86 ft. A pipe has been laid to the Ophir plant and sinking on the 30-in. calcite vein will be continued to the 200-ft. level.

BRITISH COLUMBIA.

(Special Correspondence).—The Highland mine, a silver-lead property, in the Ainsworth mining district, was bonded by American mining men last week. Despite the fact that the arbitration committee appointed by the Dominion, mine operators and miners had come to a satisfactory agreement; the men have voted down the recommendation of the board and an unsettled condition still prevails in the coalfields. It is generally understood, however, that a real majority of the men are anxious to return to work and that pressure will be brought to bear that will end the strike shortly. Several of the different districts have made application to the Minister of Labor for investigation boards to inquire into the strikes in their particular localities, so that they can get things settled and resume work.—A company, known as the Head Syndicate, has been formed for the purpose of developing the Head-Martin coal-lands that adjoin the property of the International Coal & Coke Co. Leslie Hill is consulting engineer and manager.—The Bounty mine with 16, Silver King 49, and Yankee Girl with 51 tons, are on the shipping list for this district.—The Dewdrop Fraction, Sunbeam Fraction, and Hattie mineral claims have been purchased from the Provincial Government by the Rossland syndicate of miners, who will put a force to work on development immediately. This property is in the south belt portion of the camp and adjoins the Richmond and Hattie Brown, being on the silver-lead reef that runs through this part of the camp.—P. F. Roosa has been relieved of the receivership of the Dominion Copper Co., and the New Dominion Copper Co. taking over the interests and property of the old company, Mr. Roosa has been appointed manager, which position he held in the old company before he was appointed receiver. It is thought that the new company will have things in form to resume work at the mines about August 1.—At the Donald Copper property the company is building ore-bins and a road to the railway, which is a mile distant. Continued development on this property is proving some good ore.—A force of men has been put to work getting things in shape at the Sunset mine for the resumption of work. It is said on good authority that work will be going on at the Providence mine at Greenwood before long. The company shipped 700 tons of high-grade gold-silver ore in 1907, and 50 tons last year, as little work was done. The management has been trying to place a bond issue to raise funds for work.

Rossland, June 25.

G. Weaver Loper, chief owner of the Lucky Jim mine near Kaslo, announces that a contract has been made with the Great Northern Railway Co. to use the steamer *Kaslo* to carry ore to Troup Junction for shipment to the United States at the rate of 200 tons per day. Eighteen hundred tons of ore have been shipped that assayed 53% zinc.—W. J. Wilson and P. Burns have sold the Highland mine near Ainsworth to J. S. Airheart and associates of New York. Work has been started and it is anticipated that a first shipment will be made this month.—A rich copper strike was made on the Kimberly property, 2½ miles from Kamloops, owned by H. Beckman.

MEXICO.

MEXICO.

The Seguranza Mining Co. is hurrying work on the line to bring electric power from Sultepec to its new 100-ton custom cyanide plant at Zacualpan. Joseph Nibel is manager.

SONORA.

A concession for the construction of four railroads in the northern part of the State has been granted to the Cananea Consolidated Copper Co. by the Government.—Development work at the Santa Rosalia south of Cananea is exposing good orebodies, but in the Sonora River country the protracted drought has stopped prospecting and closed some of the mines.

TAMPICO.

A gusher flowing 200,000 bbl. of oil per day has been struck on the property of George I. Ham near Tuxpan.

Special Correspondence.

GOLDFIELD, NEVADA.

Consolidated for May.—Dam Washed Out.—Florence.—Daisy.

An official report of the results of operations by the Consolidated Mines Co. in May, which has been delayed owing to the absence of the officials in New York, shows that the company produced and treated 21,630 tons of ore. The gross recovery was \$762,748, and the net recovery \$662,000. The total cost, including mining, milling, transportation, and general expense, was \$6.117 per ton. Ore shipments amounted to only 156 tons, which yielded a net return of \$92,797, and the net profits for the month were reduced to \$606,759 through the payment of a considerable sum in bullion taxes and certain other expenses. Last week's output from the mills was curtailed, for the reason that both

On the Florence, connection has been made between the bottom of the main shaft and the raise from the cross-cut at 500-ft. depth from the Engineers shaft. By July 15 it is said the new machinery for the mill will be in place. The plant will be driven by belt instead of by gear, as heretofore, eliminating a large degree of liability to breakage. The Florence mill is still treating ore averaging about \$11 per ton, and chiefly taken from lease dumps. Officials of the Florence company have paid to the assessor of Esmeralda county the sum of \$10,018, representing bullion taxes, which they at first refused to pay, together with penalties for delinquency and fees payable to the district attorney for collection.

The recent discovery of rich ore in a lease on the Daisy is proving better than was indicated by first reports. The ore is exposed in a raise above the 360-ft. level, and the vein has been opened for 30 ft. in length, showing 2 ft. of ore, a portion of which assays \$350 per ton gold. Development in the Daisy progresses as heretofore, and shipments will shortly be increased. The 400 and 500-ft. workings are in good veins, but have not yet found the ore-shoots exposed above.

Interest centres at Virginia City this week, and many are preparing to attend the three days' celebration there of the semi-centennial of the discovery of the Comstock lode.

LONDON.

Tax on Mineral Lands.—Old Mining Laws.—Derbyshire Lead.—Kalgoorlie Mines.—Great Boulder Perseverance.

The owners of mineral lands in Great Britain are aghast at the proposals of the Government for levying a tax on unmined minerals. The proposed tax is aimed at the land-owners who become immensely wealthy through their mineral rights and who draw large incomes from royalties without any risk. Nobody could honestly object to a tax on such royalties if it were possible to provide that the land-lord would not pass it on to the mining companies or the public. The present proposition provides for a tax of one-half penny per £1 per annum on the "present profitable value" of the mineral values of the estate. The "present value" of ore deposits is an intricate actuarial problem. It is not easy to explain in a few words what is meant by present value, but as an example may be cited the case of something which is worth a hundred pounds but cannot be sold for a hundred years. It is obvious that such a thing is not worth a hundred pounds now. Thus it will be seen that a landowner who possesses coal deposits that will last for a hundred years at the present rate of working will not be called to pay a tax on the total ultimate obtainable profit. There are a vast number of considerations involved in the calculation of the present value of a mineral estate. In the absence of willing buyers and sellers such valuations can never be actually made and under the proposed law they will be purely arbitrary. Perhaps, however, the proposition will not be adopted by Parliament after all.

It is probably not generally known to American readers that the mining laws of Great Britain are not uniform, and that within so small a boundary there are many sets of widely different laws. For instance, the county of Derbyshire has its own laws relating to metalliferous mining. Perhaps it would be best to call them customs rather than laws, for they have been handed down from almost prehistoric days. Here the right of the finder to lead ore is similar to the old German common mining right. The finder has absolute right to work his discovery without having to bargain with the owner of the surface land. The amount of compensation to be paid to the latter is determined by an official called the bar-master, together with a jury. If the finder stops working for a fortnight his mine may be jumped without notice. Derbyshire is underlaid chiefly with Carboniferous limestone and Millstone grit, with some eruptive rocks here and there. In days gone by it has yielded galena freely, and a number of mines are still being worked profitably. Fluorspar occurs plentifully, and during recent years substantial amounts have been mined and taken from the dumps to meet the



Map Showing Position of Virginia City and Goldfield.

were closed for over 24 hours, and operated at only part capacity for another day, owing to the washing out of a diverting dam at the plant of the Nevada-California Power Co. on Bishop creek, in California. The Mohawk mine is now supplying the principal tonnage for these mills, the larger part being taken from the big stopes in the south-eastern portion of the claim, between the 450 and 600-ft. levels. Development is progressing from the lower levels of the Clermont shaft, levels having been started at 730, 860, and 1000 ft., and from the station at 600-ft. depth, where the connection was made with the main Mohawk shaft. A drift has been started to the north, toward the Laguna claim, and with a view to cutting the extension of the ore-body from which a large tonnage is being stoped on the Lucky Boy claim. This orebody is yielding a regular production averaging \$50 per ton, and despite the presence of faults the ore remains continuous for over 200 ft. and shows a face of uniform character varying from 15 to 30 ft. wide. Levels have been driven from the Mohawk shaft under the workings of the old bonanza leases, where large quantities of high-grade ore remain, and much valuable ore has been recovered from the caved ground.

demands of iron-masters in England and America. My special reason for referring to this matter now is that there has been a heated dispute at Matlock over the possession of a mine in the neighborhood called the Providence. Matlock is one of the beauty spots of England and is a centre for visitors who believe in hydropathy. There are a certain number of producing mines in the neighborhood, but the Providence has not been very active as a producer for 50 years or more. In fact it was supposed to be worked out. The local authorities had decided to buy a strip of sylvan country for the purpose of making a park, when they were suddenly confronted by a gentleman who claimed to be the owner of the Providence mine, which happened to be situated on the property. He declared that he was the owner and that he was producing ore regularly; consequently he asked for a sum of money in exchange for his rights. The chairman of the local council argued that this gentleman had not worked it for some time and put in a claim to be allowed to work it himself. In that way it was hoped that the local council would be able to gain possession and by working the mine in a nominal manner, just sufficient to comply with the law, would be freed from further disputes. A court was therefore held by the bar-master and jury to decide the dispute, and feelings ran high, ending practically in a free fight. Eventually the court found that work had not been continuous and handed the rights over to the chairman of the council. His duty to the public in his capacity as private citizen will be to work the property in the most unostentatious manner possible. I believe, however, as a matter of fact, that there is little ore left, and probably it will only need one miner to pick out such ore as is to be found, and take as long to do it as possible.

One of the noteworthy points in connection with the Great Boulder Proprietary gold mine at Kalgoorlie is that its output has shown a gentle but steady advance from the commencement in 1895 to the present day, and in this way presents a distinct contrast to others in the district, which made big profits at first and afterward fell on evil days. The output at present is about £49,000 per month. During the year 1908, the output of gold was valued at £578,704 and the net revenue was £331,855, out of which £262,500 was distributed as dividend. The ore treated amounted to 165,428 long tons, and the working costs were 25s. 8d. per ton, which is equivalent to 22s. 9d. per short ton. This is a rise of a shilling per ton over the previous year, due to increased costs of fuel and material, extra repairs to plant, and higher wages. The treatment plant is being enlarged and before long the yearly tonnage should be increased to 200,000 tons. The ore deposits show no sign of exhaustion and the reserves are given at 731,426 tons averaging over 16 dwt. per ton. The way the deep levels are opening up is most gratifying. At the lowest level, that is, the 2200 ft., a body of ore 5 ft. wide and averaging over 2 oz. per ton for 166 ft. has been found.

The most recent information relating to another of the Kalgoorlie mines, the Great Boulder Perseverance, gives some indication that this mine is about to open up into practically a new mine at depth. In the early days large profits were made from the rich ores at upper levels, and afterward came a sensational collapse. Subsequently, under the efficient direction of the consulting engineers, Hooper & Speak, the position was retrieved, and profits have been made from comparatively low-grade ores. For example, during 1908 a net profit was made of £46,725 by the treatment of 204,406 tons of ore which produced 71,025 fine ounces. There is still some 390,000 tons of 6½ dwt. ore and 200,000 tons of ore which is put down as probably payable, all of which is above the 1100-ft. level. During the last few months the development below this level, recommended by Mr. Speak last year, has proved remarkably successful, especially at the 1750 and 1900-ft. levels, and ore running as high as 2 oz. per ton has been found. It is too early as yet to give any definite estimate of these deposits, but the directors have cause to feel pleased at future prospects. A few months ago the management of the mine was taken over by Hooper & Speak, and the operations are under the superintendence of Ernest Williams.

NEW YORK.

Cost of Copper. — British Columbia Copper Co. — Tonopah Belmont. — Curb Market. —

It has lately been reported in the technical journals that many of the Western copper mines are producing copper at or below 7c. per pound. This has led copper consumers to expect a reduction in copper prices. With the view of showing the cost of copper production, the Amalgamated Copper Co. has published the costs at its Butte mines. From the figures given, it appears that these range from 13c. per pound at the Parrot mine, and 11c. at the Anaconda, to 10½c. at the Butte & Boston. The mines in Utah and Nevada, in which the company is interested, however, are doing much better. Though not referred to in the published statement, it is well known that they are producing copper at from 6 to 8c. per pound. Negotiations are in progress between the representatives of the Boston Consolidated Copper Co. and Utah Copper Co. with a view to uniting the two companies. Should this be accomplished, the negotiations between the representatives of the International Smelting Co. and the directors of the Colorado Mining Co. in regard to the sale of that company's Iron Blossom mines and Knight smelter, at Tintic, Utah, which have lately fallen through, will be resumed.

The British Columbia Copper Co. some months ago closed its mines owing to the reduced price of copper. While they remained closed the price of the company's shares declined. Advantage was taken of this by others to purchase a controlling interest. At the recent meeting of the company in New York, as a result Adolph Lewisohn was elected to the position of managing director. The control of the Dominion Copper Co. has passed in a similar manner. Mr. Lewisohn is associated with the new International Smelting Co., and it is probable that the two larger Canadian copper companies will be guided in their future operations by the International rather than by the Amalgamated company. The British Columbia Copper Co.'s mines and collieries will be re-opened immediately. Instructions have been issued to the mine officials to blow in three furnaces and maintain an output of 2000 tons per day. Recent improvements in the furnaces are expected to result in a lowering of the cost of copper production below 7c. per pound. The company has 1,400,000 lb. of copper on hand which cost 8c. per pound to produce, and is being held for better selling prices. The production during the next few months will be stored.

Work is being actively carried on at the Guanajuato Consolidated mine, Mexico. The manager reports that the mill crushed 7383 tons of ore in May with a return in bullion of \$62,250. Concentrate sales brought additional returns.

Considerable interest was manifested on the New York Curb when the telegram was posted announcing the deep-level strike in the Tonopah Belmont. It appears that a body of auriferous silver ore between 4 and 5 ft. wide has been struck in a winze from the 1100-ft. level. This is the deepest orebody yet cut at Tonopah, and curb brokers will watch its development with much interest. Since work was abandoned in the low levels in the Tonopah Extension, Midway, and Tonopah mines, interest in Tonopah mining investments has almost ceased in New York. Investors conceived that the Tonopah mines contained only superficial deposits and exchanged their holdings in Tonopah mines for shares in mines on other fields. Local curb brokers state that they recognize the fact that Tonopah mines are among the steadiest producers in the West, and if it can be established that the deposits continue at depth, a demand of large proportions for Tonopah mining shares will result. Mining transactions have been of only limited extent on the New York Curb during the past few weeks. The public is not at present speculating on either the Stock or Curb exchanges. Whatever transactions are recorded daily, are mostly on professional account. Although everyone expects to witness a new mining boom as soon as the country recovers from the depression, few at the present time take any interest in mining enterprises. There are no new promotions being undertaken, and established mining enterprises find much difficulty in securing financial advances.

JUNEAU, ALASKA.

Perseverance Gold Mine.—Milling Methods.—Sheep Creek Power Plant.—Prince Rupert.

The Perseverance Gold Mining Co. resumed operations in Silver Bow basin about June 1, John R. Mitchell being general manager. This basin is four miles easterly from Juneau, and is at the head of Gold creek, which drains into Gastineau Channel. The ore-bearing zone consists of veins, lenses, and stringers of quartz in a body of slate and has a greenstone foot-wall, but the hanging wall is not definite. The width of material which is profitably mined is from 60 to 80 ft. Along a strike of nearly 2000 ft. the width is determined by sampling and assaying, rather than by any visible boundary on the hanging side. The ore carries free gold, which occurs in the seams and cleavages of the quartz and slate, and also in association with iron pyrite, galena, and a little blende. All the ore broken is milled, including many lenticular thin bodies of barren slate, as well as stringers of barren quartz. The entire unsorted mass is said to average \$3 per ton in gold, with a variable amount of silver. The orebody is opened by a cross-cut, which intersects it 2200 ft. from the portal, and 1200 ft. below the surface, measured on the dip of the lode. From the place where the cross-cut enters the orebody a drift has been driven 1300 ft. east on the ore and 560 ft. west. There are nine air-drills in use, including the Wood, Waugh, and Murphy. At present haulage is by mule-power. A surface tramway delivers the ore from the



Alaska-Perseverance Mine and Mill.

cross-cut to the mill, where there are crushers—one No. 5 and two No. 3 Gates. The crushed ore, ranging in size up to 2½ in. diam., is conveyed to the mill-bins, from which it feeds into the twenty 5-stamp batteries. It is stated that 70% of the saving is made on the amalgamating plates. The pulp passes from the plates to James concentrating tables, of which there are 34. The concentrate amounts to 400 tons per month, consisting of iron, galena, and zinc, carrying 2 oz. gold per ton, with some silver.

On the Sheep creek side of the mountain the Perseverance company has commenced two cross-cut adits from a point 180 ft. above tide-water, to be driven to the same orebody on which they are now mining, but which will cut it at a depth of 2400 ft., measured on the dip. This plan contemplates the driving of two parallel adits, 30 ft. apart and 11,000 ft. long. Mr. Mitchell claims that better ventilation and cheaper first costs are possible with two single track adits and electric haulage, than with one of sufficient size for a double track. A gas producer plant is being installed near tide-water, on the Sheep creek side; one Weber engine has been installed already and three others will be put in later. The gas engines will be used to operate electric generators. The plan is eventually to erect a mill of large capacity on this side, where snow will not interfere.

At Prince Rupert satisfactory progress is being made in the building of the Grand Trunk Pacific. The grade is nearly complete for 100 miles up Skeena river and rails will be laid this fall. Beyond this point the route is not announced, but the discovery of a satisfactory coalfield in Bulkley valley may have some bearing. At Prince Rupert building docks is going forward rapidly.

KALGOORLIE, WESTERN AUSTRALIA.

April Output.—Golden Ridge Reserves.—Graphite in Ore.

The April gold output from the whole State amounted to \$2,920,000 and dividends \$1,250,000. Following are the returns from the principal mines:

| Name. | Tonnage. | Value. | Profit. | Dividend. |
|---------------------------|----------|-----------|----------|-----------|
| Associated | 11,680 | \$113,000 | \$41,000 | ..... |
| Asso. Northern Blocks.. | 3,613 | 33,000 | 13,000 | ..... |
| Golden Horseshoe | 24,773 | 260,000 | 100,000 | \$450,000 |
| Golden Link | 3,116 | 25,500 | *1,500 | ..... |
| Golden Ridge | 2,265 | 24,000 | 14,000 | ..... |
| Gt. Boulder Proprietary. | 16,262 | 247,000 | 130,000 | ..... |
| Gt. Boulder Perseverance. | 18,825 | 140,000 | 28,000 | ..... |
| Great Fingall | 14,053 | 74,000 | *8,500 | 46,000 |
| Hainault | 5,064 | 31,000 | 3,500 | ..... |
| Ivanhoe | 18,819 | 205,000 | 100,000 | 450,000 |
| Kalgurli | 10,720 | 140,000 | 80,000 | 185,000 |
| Kalgurli South | 9,038 | 61,000 | 13,500 | ..... |
| Lake View Consols..... | 8,000 | 62,000 | 15,500 | ..... |
| Oroya-Brownhill | 11,516 | 103,000 | 38,000 | 110,000 |
| Oroya-Black Range | 4,500 | 56,000 | 19,500 | ..... |
| Sons of Gwalia..... | 12,949 | 102,000 | 23,000 | ..... |
| Sons of Gwalia South... | 1,950 | 25,000 | 7,500 | ..... |

*Loss.

As the Lake View Consols interest has been acquired by another syndicate, crushing operations have ceased at the former mill; and most likely a small mill will be erected on the Eclipse lease of the Golden Link. When working the oxidized ore some few years ago, the Link company had a 20-head battery and cyanide plant at work, the stamps crushing 9½ tons each per diem for a considerable period. This mill was struck by lightning and totally destroyed, everything being motor driven.

The ore reserves in the Golden Ridge are announced as 55,000 tons, with a reasonable value of \$11.50 per ton. This mine is locally owned, is 14 miles southeast of the Golden Mile, and is opening up rather well. Cross-cutting is in progress at 500 ft. In the other levels the lode is up to 5 ft. in with, and assays \$14 per ton. A 20-head battery and cyanide plant is in operation, and treatment is plain salting.

In the Boulder No. 1 lease, the Ivanhoe east lode is 10 ft. into the property with payable ore. The east branch of the No. 3 lode in the Horseshoe was cut at 2000 ft., gold and tellurides showing, the lode being 5 ft. wide, worth \$30 per ton. Good reports come to hand from the Sons of Gwalia, and a good deal of ground has been pegged in the hope of getting the lode.

Along the east side of the Golden Mile, and even in the Great Boulder, there is a fair amount of graphite, mostly in the form of a slate and schist. In some parts of the mines it occurs in bands, and in others finely distributed. When it occurs in bands it can be picked out, but when distributed it so far cannot be dealt with satisfactorily. In the dry-crushing mills it will pass through the roasters almost unchanged, and when the roasted ore is mixed with the circulating waters the trouble commences. In such ore it may be noticed floating upon the pulp in the grinding pans. Here it collects on the overflow lip, and no doubt a great deal floats away with the pulp to the settlers, and also with the thick slime to the agitators. The circulating waters are generally weak KCN washes—say, 0.04—from the filter presses, and contain from 50c. per ton upward in gold. No doubt some precipitation of the gold takes place in the settlers, but it is evidently when in the agitators with a strong solution—0.08 KCN—while the gold is being dissolved, that most of the damage by the graphite is done. Extraction fails of course, but this residue can be re-treated successfully. By increasing the final heat in the furnaces a great deal of the graphite may be destroyed, but such heat would probably sinter the ore, which is not wanted. It will be interesting to follow the work in connection with the treatment of the Lancefield ore, which is supposed to have graphite distributed throughout the lode. Many well known metallurgists and others have tried but failed.

LIMA, PERU.

Copper Production.—*Santa Inez.*—*Chimbote Coal and Harbor Syndicate.*—*Huaylas Valley Railroad.*

Mining conditions in Peru are slowly improving after the set-back following the drop in the price of metals. The copper production for the past year (17,000 tons at 2240 lb.) shows a decided increase, due to the steady monthly gain of the Cerro de Pasco smelter production; this increase was offset by the shutting down of many small shipping mines which had yielded a good output in the time of better prices. The Cerro de Pasco company is gradually reaching its maximum production, due to the successful operation of the reverberatory furnaces for the fine ore, four of which, now treating 100 tons each of calcine daily, have been running for some months. The fifth furnace is suffering from lack of coal, which is only a temporary condition. The 400 tons of calcine, produced from eight McDougall roasters, require 160 tons of coal. The screening plants, at the mines, are not yet in operation; as a result the percentage of coarse ore for the blast-furnaces is not over-abundant; however, the present curtailed supply shows a 10% increase in the capacity of the four water-jackets, which will undoubtedly be improved as soon as the screening plants are running. Lack of cars on the railroad from Morococha has seriously interfered with the handling of the ore from that district—about 150 tons daily. The production of copper for the month of May will exceed 3,000,000 lb., and by the beginning of July, barring the unforeseen, the monthly production should be about 4,000,000 lb. It is expected that by the end of the year the company will be producing at the rate of 50,000,000 lb. per year.

The decline in the price of silver has not seriously affected the silver producing mines, that is, those mines which chiefly yield silver. The Santa Inez mines have apparently again found the shoot of ore which some years ago produced a yearly net profit of £40,000 over a period of seven years; but difficulty in handling water has handicapped development. At present there seems to be considerable interest taken in gold mining, particularly in vein mines. The latter industry, with two or three exceptions, seems to have been overlooked in the quest for copper and silver.

The Chimbote Coal & Harbour Syndicate, Ltd., reports satisfactory progress of its undertaking. The syndicate was formed in October last, and owns extensive coal claims situated about 64 miles from the coast and has been granted by the Peruvian Government a concession to build a railway from Tablones to Recuay, about 130 miles. From Tablones to Chimbote harbor, some 30 miles, a line is running, owned by the Peruvian Corporation, Ltd., and the concession gives the syndicate power to parallel this line if required. The syndicate also has a controlling interest in the Pier company at Chimbote harbor, the company having an exclusive landing monopoly for 16 years. This is one of the finest natural harbors on the South American coast. Concessions for the construction of the railway had been previously granted, but owing to insufficient financial resources to complete the work the concessions were abandoned. From Tablones toward the coalfields about 28 miles of embankment work has been carried out, and has been surveyed and passed by the Government, so that only some six miles of such work, plus rail laying and bridges from Tablones to the syndicate's coalfields, remains for the completion of railway communication with the harbor. The Peruvian Corporation, Ltd., has promised friendly support to the undertaking and to assist in establishing railway communication between the syndicate's coalfields and the port of Chimbote. As soon as through communication is established it will be possible to deliver at least 150,000 tons of coal per annum at the seaboard. There is a large demand for coal, 1,500,000 tons per annum being shipped from Great Britain, Australia, and other points to the West coast. The Chimbote coalfields have already been partly opened.

The coal is stated to outcrop for 20 miles along the route of the railway. From the coalfields on to Recuay, along the Huaylas valley, the railroad will pass through the most densely populated district in Peru, the inhabitants number-

ing some 500,000. A considerable amount of work has already been carried out beyond the coalfields, including seven rock tunnels.

SALT LAKE, UTAH.

East Tintic Activity.—*Water in Centennial-Eureka.*—*Fink Makes Blister Copper.*—*Silver King Suit.*—*Consolidation of Bingham Mines.*

Within the past six months the activity in the East Tintic district has been especially great. Within a radius of less than a mile are a dozen hoisting plants now actively engaged in bringing waste and ore to the surface. Most of these shafts have a shallow depth, the deepest being the East Tintic Development, which is 350 ft. from the surface. The Grutil, Eureka-Lilly, Tintic Standard, Montana, Big Hill, and several other groups are being developed, and some ore has been found in each of these properties. The East Tintic Development is extracting ore from a depth of 235 ft., and will soon have the drift from the third level in the ore. Near the surface this ore carries much lead, but in depth the silver increases perceptibly. More companies are preparing to engage in mining in that part of the district, and indications point toward this becoming one of the richest areas in that camp. Among those interested are the Knights, Snyders, Loose, Haldaways, Bestlemeyer, and others who are classed among the pioneers at Tintic.

Edward Fink has completed a test in his furnaces, in one of which he made a 90% copper matte, and in another blister copper. It is understood that Samuel Newhouse, who has been called to New York, will arrange for the construction of a permanent plant and install the Fink process. Some lead ores from Alta and other nearby camps are to be tested in these furnaces, and if successful Fink smelters will be manufactured and forwarded to isolated Western camps.

Permission to file an amended complaint has been denied the Conkling Mining Co., in its suit to recover damages from the Silver King Coalition Mines Co. In the original petition the Conkling company alleged that the Silver King had wrongfully extracted a million dollars worth of ore from that lode. One-fourth interest in the property is owned by the Silver King and three-fourths by the Conkling. A survey of the claim has shown that the Silver King extracted a bonanza orebody clearly within its end lines, and that the Conkling survey overlapped the Silver King between about 140 ft. It is understood that this decision practically settles the controversy, and that the Silver King Co. will be allowed to mine the ore in that portion of its territory without further interruption.

A heavy flow of water has been tapped in the drift off the 2200-ft. level of the Centennial-Eureka mine, owned by the United States Smelting Co. Large pumps have been ordered, and the management hopes to have the water under control so that driving can be continued within a couple of weeks. A heavy cave also occurred in the mine a few days ago. In some of the abandoned workings the timbers had slipped, and ground from the fourth to the eighth levels fell. It is claimed that no damage was done to the mine, all the ore having been extracted.

Officials of the large Bingham copper mines continue to deny the report that there will be a consolidation of properties. D. C. Jackling, of the Utah Copper, says that he can see no advantage in taking in other mines. It is known that Boston Consolidated officials have refused to consider any proposition by which their property should be put in with Utah Copper on the basis of two shares of Boston for one of Utah Copper. That there will be a time in the course of a few years when it will be of immense value to both companies to join hands in the operation of these properties is conceded by all interests, but it is believed that they are too far apart at this time to make a deal possible. E. A. Wall, who sold his entire holdings in Utah Copper, and has since taken a large block of the Boston Consolidated, is said to be one of those opposed to consolidation. It is believed here that the Utah Copper interests would be willing to pay a large sum for the control of the Boston Consolidated, and this may eventually be the manner in which the properties will be consolidated.

BUTTE, MONTANA.

Butte & Superior.—Original Con.—Sarsfield.—West Butte.—Highland.—Little Rocky Mountains.

In the Butte & Superior, driving is in progress from the 1400-ft. level west. On the 1200-ft. level the Jersey Blue vein has been cut, and on the 1400 a cross-cut is being driven to cut the Black Rock vein. This may be broken into any day. Three hundred feet east of the shaft on the 1200-ft. level the big zinc vein has been found, and numerous cross-cuts show it to be 55 ft. wide. The ore will assay about 25% in zinc. One carload per day is being shipped to the new zinc concentrator at the Butte reduction works.

The figures for the year's work, ending June 1, 1909, in the properties of the Original Consolidated Mining Co., given to the county assessor for taxation purposes, show the net proceeds to have amounted to \$152,625, which is \$7000 less than for the year ending June 1, 1908. This company is a close corporation, the stock of which is held by W. A. Clark. It owns the following mines: Original, West Steward, Fashion, Woolman, Burt, Dives, Little Treasure, Skip, Whitmore, Mount Moriah, Late Acquisition, and Late Acquisition Spur. The figures show: ore mined, tons, 248,761; gross yield per ton; \$8; cost of mining, \$1,068,683; freight on ore, \$56,683; cost of reducing, \$755,062; amount expended for labor, \$660,283; cost of mine supplies, \$408,400; net proceeds, \$152,625.

Operations on properties east of Butte are becoming more active each week. The Sarsfield, situated at the mouth of Park canyon, a half mile or so from the Pittsmon property of the East Butte company, has been taken over by lessees. The shaft, already 150 ft. deep, was cleaned out and a cross-cut was started to catch the north and south fault which runs through all the properties in that part of the belt. Another tunnel which runs into the fault is being cleaned out, and in this is shown 12 or 15 ft. of good shipping ore, a mixed silicate and oxide. In the bottom of the shaft there is a vein showing several feet of sulphide ore. The owners of the Sarsfield are Charles Mattison, Jerry Clifford, James A. Murray, Mrs. James A. Forbis, John Macginniss, and Charles S. Warren. Negotiations are under way to effect a combination of what are known as the Freudenstein with other interests in the southwestern portion of the city, and to re-open some of the old workings. A combination of this kind would result in the development of the Elba, North Pole, Germania, Humboldt, and other properties.

In the Highland district, 17 miles south of Butte, a great deal of work is being done this season, and several good strikes are reported. On the Richmond claim, operated by Bluff, of Butte, six or eight feet of gold ore have been uncovered which will assay \$25 to \$30 per ton. The Tiltens, operating what is known as the Old Nevins property, have sunk a shaft 300 ft. deep, and have many thousands of dollars' worth of ore blocked out. During the past two or three years this property has shipped about \$20,000 worth of ore. It was a good producer in the early days. The property in the Highland district is situated along an immense contact of granite and limestone that runs in a horseshoe course around the base of Red mountain. It is only recently that the prospectors and miners there have prospected this contact, which is now taken up for a distance of about seven or eight miles, and there are between 15 and 20 prospectors and miners at work.

Reports of the work being done on the August mine, near Landusky, in the Little Rockies, indicate that an unusually rich property is being opened. Last week a shipment of ore to the East Helena smelter of the A. S. & R. Co. assayed from \$350 to \$1000 per ton in gold. The company is employing 35 men, and has much ore blocked and much on the dump, but owing to the heavy roads at this time of the year, no effort is being made to ship regularly. The property is owned by Phillips & Whitcomb, Coburn brothers, and L. R. Goslin. The coming summer will see active work in the Little Rockies. There are more prospectors in the hills than usual, and development is being planned by many persons interested in that part of the country. It has long been recognized as one of the best districts in the country for ores amenable to cyanidation.

TORONTO, CANADA.

Cobalt Dividends.—La Rose.—Nipissing.—Elk Lake.—Gowganda.—Sale of Gillies Limit Lots.

A number of the leading Cobalt mines have declared dividends this month, including La Rose 3% with 1% bonus; Nipissing 3% with 2% extra; Temiskaming & Hudson Bay \$3 per share on the old capitalization, or 300%; Crown Reserve 6% with 9% bonus; Buffalo 5% with 3% bonus; and Right of Way 6%. Nevertheless the stock market continues dull and depressed. The market has been unsteady ever since the Temiskaming passed its dividend. Confidence does not seem to have been restored by the Directors' statement, justifying the act on the ground that a cash reserve and funds to install a concentrating plant were needed, the company having low-grade ore on the dumps ready for concentration of an estimated net value of \$500,000. The public naturally asks, why under the circumstances the company declared high dividends earlier in the year unless with the object of manipulating the stock? The La Rose annual statement presented at the shareholders' meeting at Montreal June 15, is a splendid showing. The total output for the twelve-month ending May 31 was 6164 tons containing 3,010,831 oz. silver, valued at \$1,364,372, and the net operating profit \$1,093,572. It cost about 16c. per ounce to recover this silver and develop the several properties, leaving a profit of about 35c. per ounce. Probably more than two-thirds of the total tonnage were taken from the La Rose main workings. The one fissure which has given the mine its distinctive character has altogether produced so far over 4,000,000 oz. silver. The Nipissing annual statement showed a surplus on June 14 of \$1,092,000, including cash in hand and ore at the smelter, in transit, and at the mine. The Nipissing led the shipments last week with 198 tons. A good vein has been cut at the Badger in driving in the 100-ft. level and followed for over 40 ft. A specimen carrying rich native silver and containing over 3000 oz. per ton has been placed on exhibition in Toronto. Both the Badger and the Beaver are preparing to make initial shipments and there is considerable rivalry as to which will take the lead. The Kerry Mining Co., operating a leasehold owned by the Peterson Lake, has found a narrow but rich vein containing native silver, stated to assay over 4000 oz. per ton. High-grade ore is being taken out of the Little Nipissing. The Beaver vein at the 200-ft. level was lost for a short time, but has been picked up and is about 10 in. wide with 4 in. of good ore. The installation of the new plant, which will be completed in a few days, will enable the company to have four drills at work in place of two. The Silver Cross mine in the Cross Lake section of the camp, has struck a lead 8 in. wide at the 65-ft. level of No. 2 shaft, composed of native silver, niccolite, and smaltite.

The shaft at Elk Lake Discovery mine is down 154 ft., being the greatest depth so far reached in the Elk Lake district. Driving has been commenced at this level toward vein No. 4, which shows native silver at the surface. Work has been begun on the Mother Lode in Elk Lake district. The shaft will be put down to 150 ft. The Otisse has cross-cut the first of nine veins to be tapped at the 75-ft. level. It is composed of a 6-in. calcite vein with a good showing of native silver, and some 2 ft. of fissure filling shot with silver leaf, and a calcite band shows rich with silver. At Gowganda the steam-plant of the Bartlett is in full operation and the shaft is going down at the rate of 12 ft. per week. The shaft at the Boyd-Gordon is down 87 ft., at which level a vein 4 in. wide, carrying about 3000 oz. silver per ton has been reached by cross-cutting. The Ontario Government has sold by tender, subject to working conditions and a 10% royalty, 15 lots comprising in all 870 acres of the Gillies Limit, adjoining the Cobalt area, the total price received being \$74,643. A large number of tenders for the other properties offered were rejected as being too low. The sale excited but little interest among mining men, owing to the withholding by the Government of all particulars tending to throw any light upon the value of the property. In fact nobody outside of official circles knows whether there is an ounce of silver on any of the properties.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Timber amounts to only about 15% of the cost of shaft-sinking, even in localities of extremely high prices.

Tantalum is derived from tantalite, FeTa_2O_6 , and columbite, $(\text{FeMn})\text{Nb}_2\text{O}_6$. It is used for making filaments for electric lights.

Copper ores are peculiarly subject to secondary enrichment, and usually show a marked increase in metal at the base of the oxidized and top of the sulphide zone.

Mount McKinley is the highest mountain on the North American continent. It rises to 20,300 ft. in height, about 10,000 ft. above the crest line of the Alaskan range to which it belongs. The mountain is a dome of granite.

Oxidized ore of the same grade can usually be treated more cheaply than sulphides. This is not, however, always true. Low-grade ores of lead, zinc, and copper, in the form of sulphides may be concentrated when oxidized ores having the same percentage of metal would be valueless.

Schists may be chemically and mineralogically identical with slates, but are made up of coarse particles, or possess a wavy structure, or both features. Both slates and schists may have originated in deposits of identical character, but have undergone different processes of metamorphism.

Theoretical horse-power required for pumping may be determined by multiplying the number of gallons per minute by the amount of head in feet and dividing by 4000. The result must be increased to allow for friction of pipe and inefficiency of plant, according to the character of the installation.

Earthquakes have been explained, and methods of observation and measurement given in great detail, in a paper recently printed by Harry F. Reid, of Baltimore, bearing the title 'Conditions Leading to Tectonic Earthquakes, Instruments Used in the Study of Earthquakes, Etc.' The paper was presented to the American Philosophical Society in Philadelphia.

Sampling of ore in the ground gives usually a higher average value than actual mill-runs. In three West Australian gold mines two years' sampling gave assays 12% above the mill-yield, plus the content of the residue. On the Rand the actual extractions are generally about 78 to 80% of the average shown by sampling in the mine, and 90 to 92% of the assay value of the mill-heads. At Broken Hill, New South Wales, three lead mines yield about 12% less than the sampling indicates to be present.

Location of an excessive area does not invalidate a mining claim, as a rule, unless the excess be so great as to raise presumption of bad faith. The ex-

cess is cast off, and the claim is valid for the balance of the area. When the senior locator has himself specified the extent of his claims in each direction from the discovery point, it would seem only reasonable that he could not take advantage of his error in making an excessive location. The courts would be disposed to grant this excessive area to a junior overlapping locator.

Fine gold in sands and gravels is often difficult to save, and sometimes success baffles the operator completely. It must be realized that the term 'fine gold' does not refer to any definite variety of gold; if it did, one system would fit all cases. The gold in different districts varies widely in character. The size and shape of the grains differs from point to point, in one place being round, in another oval, again flat and round, or flat and oval, smooth or rough as to surface, regular or irregular as to shape. All these conditions affect the rate of settling of the particles in the sluice-current. Still another factor is the specific gravity of the particles, due to the alloy-ratio, or fineness, of the gold, which is also a variable.

Saving fine gold in placer mining is accomplished in a great variety of ways. The riffle-system is still the most successful, but there are a great many different designs. The angle-iron type of Hungarian riffle is one of the most successful. This consists of a series of small angles, with the horizontal leaf about 1 in. wide, set so that it points down-stream. The object is to produce an eddy under the projecting leaf, to facilitate arresting the gold. It is found useful at times to alternate these riffle-frames which are set with the riffles transverse to the current, with other plain iron-bar riffle-frames set in the direction of flow through the sluice. Mercury is usually fed at intervals into the top of the sluice. The ordinary form of wooden riffle, 1 in. deep, made in frames for convenience in handling, will do good work, which is improved by screening the coarse material. Revolving amalgamators, of the barrel or cylinder type, occasionally improve the saving, but at increased cost.

Black sands in themselves have no market at present. They are a complicated mixture of magnetite, ilmenite, and a host of iron-bearing minerals and basic silicates. Some gold invariably goes over with these sands, and hence they are occasionally worth saving on that account, though rarely. The only efficient means is to concentrate the screened sand on Wilfley or other table concentrators. It is a mere question of what will pay. The resulting concentrate is seldom rich enough for shipment, and requires local treatment for extraction of the gold. Amalgamation is commonly unsuccessful, but cyanidation will give good results. It may be noted that after having passed gravel over one set of riffles, it often pays to screen a little closer and pass the undersize through a second sluice with another set of riffles. A second washing of gravel-tailing which had been hydraulicked has in some cases proved as profitable as the original treatment. A case recently occurred also in a well known dredging field where it has paid to re-dredge the tailing piles.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Vacuum-Pump in Cyaniding.

The Editor:

Sir—In reference to the letter, signed by Alfred James, published in your issue of May 15, I am sorry to disagree, especially in public, with an old friend and colleague, but I cannot let Mr. James' statement that "the vacuum-pump and the cyanide process were both introduced into South Africa before J. S. MacArthur ever arrived in that territory," pass without correction. The facts are that the Cassel Gold Extracting Co. controlled the MacArthur-Forrest patents, and sent expeditions to various parts of the world with a view to the installation of the process. Early in 1889 Alfred James went to South Africa, and in the autumn of the same year returned, reporting that there was a good field for the process. Arrangements were made, and late in the same year this company sent Mr. James, at the head of a few skilled men, to erect a cyanide plant for demonstrating the applicability and commercial value of the process in South Africa. The directors of the Cassel company at the same time decided to send me as their technical manager, to take the responsibility of the actual demonstration. I arrived in May 1890. The plant was not quite finished, and it was only in June, and under my supervision, that the first demonstration of the cyanide process in South Africa was made. No one wishes to minimize the part Mr. James took in the introduction of the process. He then displayed all his characteristic energy and skill, but, like other able men, he is able to make a mistake, and has done so on this occasion.

JOHN S. MACARTHUR.

Glasgow, June 4.

Santa Eulalia Camp.

The Editor:

Sir—Believing that the numerous errors of statement made by the compiler of the article on the Santa Eulalia mining camp in the issue of the MINING AND SCIENTIFIC PRESS of January 2, are apt to confuse, I beg leave to note some of them as follows: As to values: the assumption, "that the mining of those days was on rich ores from the very surface," in connection with the later statement as to the present "output not exceeding an average of 20 oz. for the better-class ores," is misleading. In the eighteenth century, measured in terms of gold, silver was worth about two and one-half times as much as at present, while labor costs and conditions in Chihuahua were such that one peso would produce as much silver as six pesos will now. In other words, while it is a fact that the early miners followed only 'pay' from the surface down, as a rule 10 oz. was as good to them then in Santa Eulalia as 60-oz. ore is now. As to the better class of ore today, averaging but 20 oz., it is ridiculous. The statement issued by the San Toy

Mining Co., January 15, concerning their Galdeana mine, says: "the ore blocked out may be estimated to contain over 30,000 tons running 20 oz. silver, not of sufficient value for profitable extraction at present prices of metal." But current published statements give orebodies in their Juarez mine of upward of one million tons of 60-oz. ore. Fifty dollars per ton is a frequent basis of settlement. It is well known that orebodies of vast extent in the Dolores contain from 2000 to 20,000 oz. That these things are kept quiet does not make them non-existent.

As to the formation, that the lower portion of the elastic covering is of "sedimentary" instead of "aqueous-explosive" origin can well be doubted. Faulting to the extent mentioned is inconsistent with Kimball's survey. Nor do the strata at the summit of the dome as given by Kimball dip first at 5 and lower down at 30 to 40°, but just the reverse. The statement that the breccia and conglomerate at Sierra Mojada are estimated at 1800 ft. is confusing, inasmuch as this base of conglomerate is always limited in depth, and that only the 'cantera' proper in its various forms has attained this thickness. Contact deposits above the lime exist. Deep workings so far confirm the northerly direction of the genetic fracture-zone referred to by Argall, and so far no deep mines have been found far away from it. That some connection exists between the present topography and the leaching of the silver downward along this zone will no doubt be recognized later, as well as the lateral extent of this district.

LOUIS LANE.

Chihuahua, Mexico, June 20.

Official Definitions of Mining Terms.

The Editor:

Sir—A pamphlet entitled 'Suggestions to Authors of Papers Submitted for Publication by the United States Geological Survey,' by G. M. Wood, has been recently issued, and is of much value to all who write on geology and mining. Of special interest to mining engineers is a section entitled 'Reports on Mining Districts'. It would obviously be helpful to have an established standard for the guidance of engineers in preparing mining reports, and a publication from the Geological Survey should carry great weight in establishing such a standard. A careful perusal, however, of the section above mentioned leads to the conclusion that it has not been subjected to critical revision. It is proposed, therefore, in the interest of a standard nomenclature, to review briefly some points which excite interest or criticism.

Ore.—"A natural association of minerals from which one or more of the useful metals may be extracted." This definition precludes the application of the term ore to a single mineral. Under this rule, a magnetite or hematite, unmixed with other minerals, would not be an ore of iron. This is obviously contrary to established usage and not to be commended. The definition of an ore having already been freely discussed in these columns, further comment is unnecessary.

Gangue.—"The term 'gangue' is properly applied only to the earthy or non-metallic minerals that are

of common occurrence in ore deposits, such as quartz, barite, chlorite, fluorite, calcite, and dolomite." This definition could not be applied in the case of a copper or silver ore disseminated through a sandstone or other rock, for the rock is not a mineral; yet, in this case, it must be called gangue, for there is no other term in common use to designate valueless material enclosing or associated with ore.

Vein.—"An ore-bearing vein is a single body of metalliferous minerals occupying or following a fissure, both walls of which generally, but not invariably, are well defined." The expression "body of metalliferous minerals" seems to be inapplicable to a quartz vein carrying auriferous pyrite. Pyrite is a metalliferous mineral, but it is inadvisable to use the term metalliferous with reference to quartz, because it does not always carry metals.

Lode.—"Where several veins are so closely spaced that the ground between them becomes in places ore-bearing, and in the whole width constitutes an orebody, the assemblage is called a lode." This definition of lode is clear and supplies a concise description of a type of ore deposit which deserves differentiation. It remains to be seen, however, whether this definition will be generally accepted. In common usage the term lode is synonymous with vein, and has been so accepted in several important court decisions.

Shear Zone.—This is defined geologically as "the zone along which the rocks have been sheeted or laminated by a shearing stress with some lateral movement, but which is by no means necessarily or even commonly mineralized." The suggestion is further made that it is "advisable to restrict its use to deposits formed along geologic shear-zones where the resulting water channels were so irregular that they can not be defined by any of the other terms already given." The writer has applied the name 'metallized shear' zone to a type of ore deposit very common in Sonora, and has several times discussed its characters in the columns of the MINING AND SCIENTIFIC PRESS. It is formed in a zone where the sheeting has been very close, the parallel fault-planes having an average interval of a few inches. This results in a mass of shattered rock, which differs from an ordinary fault breccia in that the rock fragments have not been materially displaced from their original position with reference to adjacent fragments. A fault breccia may, however, occur within the zone of shearing. Through this porous zone a metalliferous solution may readily flow and, under proper chemical conditions, metallic minerals may be deposited in the interstices of the breccia and within the rock fragments, the deposition being associated with varying degrees of replacement. Now these deposits are often as regular in form as any true vein, but the limits of the metallization are not always abrupt and the boundaries of the ore are only to be ascertained by assay. The type is unquestionably entitled to a distinct designation, and the name 'metallized shear zone' seems accurate and satisfactory. To say mineralized shear zone does not convey the same meaning, for a shear zone may be mineralized with silica and carry no metal.

Sheeting.—"The term 'sheeting' or 'sheeted zone'

may be used where the movement has resulted in parallel fissures that have left thin sheets of country rock between them." Obviously this type of fissuring, when the fissures are wide enough to permit the deposition of vein-matter, causes the formation of a lode as above defined.

True Fissure Vein.—Under this head, objection is made to the word fissure as pleonastic, and it is proposed to use, as a better term, the expression true vein. While the briefer form is preferable, it is probable that custom will long sanction the use of the old expression 'true fissure vein'.

Ore-shoot, Pay-shoot.—"An ore-shoot or pay-shoot is that part of a deposit which is rich enough to exploit." While this is often true, it is not always so. A shoot is often an expansion of a vein or of its metallization, and the vein may be rich enough to exploit for a considerable distance, the shoot or shoots being wider or richer portions of the orebody which offer larger inducements to the miner.

Contact Deposits.—"The term 'contact deposits' should be restricted to deposits which have been formed by contact metamorphism, and which carry the minerals characteristic of such action. Such use eliminates from this category many forms of deposit that have been so termed, simply because they happen to occur at the contact of two different kinds of rock, without regard to their origin. Contact deposits, as thus restricted, occur mostly in limestone, at or near its contact with an intrusive igneous rock." This restriction of the use of a familiar term leaves the miner without any convenient appellation for a very common sort of ore deposit. The plane or surface of contact between two different rock formations often affords a channel of flow for metalliferous solutions, and the resulting deposits are usually different from true veins, and deserve a generic name to indicate their type. It would seem as if scientific needs might be satisfied by selecting a specific name for deposits associated with contact metamorphism and leaving the older term, long in common use, for the general designation of ore deposits formed on planes of contact.

Impregnation.—"As a general rule, care should be taken to avoid using the name of a process as the definition of a type of deposit. The term 'impregnation', for instance, has been used by different writers in many and conflicting senses. It properly signifies the introduction of mineral substances in a finely disseminated condition into rocks, either as a filling of open spaces or as a replacement of certain minerals. To describe ore occurring in small, irregular, disconnected patches throughout the mass of a rock, 'disseminated deposits' is a preferable term, for it has no genetic signification." This statement does not seem to cover the whole ground. Minerals, such as sulphide ores, may primarily be disseminated through a rock and, by the alteration or decomposition of these disseminated mineral particles, the rock may be extensively impregnated.

Tunnel, Adit, and Drift.—These are defined according to custom, and the following additional distinctions are given: "An adit level and a drift are galleries running on the vein or in the strike of the

orebody; a tunnel is intended to cross-cut several veins or orebodies, and hence runs at an angle to their strike. A drift that runs at an angle to the strike is called a cross-cut drift or simply a cross-cut." The above statement of the purpose of a tunnel is somewhat unusual and limited, since it assumes the existence of more than one orebody and ignores tunnels driven for drainage or transportation.

Mine, Prospect.—"It may be difficult to decide whether a given property shall be called a mine or a prospect, and no hard and fast rule can be laid down to cover all cases." This statement has much truth, and might be commended to the attention of the Mining & Metallurgical Society of America for consideration in connection with the protection of investors. The author continues, "In general, shafts that are less than 100 ft. in depth, with less than 100 ft. of drifts, and that have not produced ore in commercial quantity, should be termed prospects. The essential feature of a mine is the production or presence of ore in marketable quantity, but the development and equipment of some unproductive properties are so extensive and complete as to warrant the application of the term 'mine', on the ground that it is less misleading than prospect." It is somewhat unusual to apply the term prospect to the shaft, rather than to the property in which the shaft is sunk, and the fact that a mine has produced in the past does not remove it from the category of prospects if the uncertainty of its future tonnage consigns it to that class of properties. The distinction between a prospect and a mine is partly expressed by saying that a prospect becomes a mine when enough ore has been blocked out to justify the erection of a reduction plant, but a mine that has been richly productive, if development is not kept well in advance of mining, may revert to the condition of a prospect, although not exhausted. Further, the author takes a position unsafe for investors, in considering that mere development work or equipment justify giving the name 'mine' to a prospect. The fashion of calling a deep hole in the ground, or a long tunnel, a mine has enabled unscrupulous promoters to swindle thousands of unsuspecting people. It may, of course, be unpopular with some owners of mineral properties to insist on a rigid definition of the word 'mine', but it is needed quite as much as a definition of the word 'ore'.

The staff of the United States Geological Survey in charge of Mining Geology has had so extended an experience in this field that it seems quite appropriate for that organization to prepare a glossary of terms used in describing mines and mineral properties, but such a glossary should be subjected to careful criticism in order to perfect the definitions adopted and make them harmonize, as far as possible, with established usage.

F. J. H. MERRILL.

Nogales, Arizona, May 18.

Crucible Assays.

The Editor:

Sir—Relative to an article in your issue of June 12 under the heading 'Crucible Assays', by A. A. Steel, I desire to say that it may be very well to go into the theory of fluxes, and no doubt it is of ad-

vantage to anyone to have this knowledge. But to the slow process as outlined I must take exception, and I am sure that a great many other assayers doing custom work will join me. Where samples of ores for assay come in all sizes and shapes, some in a chunk, some in small kernels, and some ground to a pulp, the work would be much prolonged. In our office we use a flux composed of 60 parts sodium carbonate, 55 parts litharge, 15 parts borax, and with flour or nitre added to suit the ore. Of course the litharge may be reduced in the case of a rich lead-ore, or increased in the case of rich copper ores.

We have used a number of different fluxes, but find this the best mixture of all, and even in the case of complex ores we have no difficulty whatever. In the case of an ore with a lime gangue we add a little silica to keep the crucibles from being corroded, and also with ores which have little or no gangue material. In case I have not caught the real drift of Mr. Steel's article I would be pleased to hear more from him.

GEORGE DOYLE.

Osceola, Nevada, June 18.

Cost Sheet for Mines.

The Editor:

Sir—An article entitled 'Cost Sheet for Mines', by Algernon Del Mar, appears in your issue of June 5, that looks to me to be subject to criticism. He says, "estimate the mining cost on the number of tons mined, including the waste, etc." In my opinion, mine costs figured in this manner would be absolutely misleading; the amount of waste mined should not be considered at all. The object of keeping a record of costs is, primarily, to be able to tell whether or not there is a margin of profit, and what that profit is; in mining ores, if in mining one ton of ore the miner takes out a ton of waste, and then divides the cost of doing this work by two, he simply fools himself. If such a method of figuring mine-cost is correct, it is a simple matter for the manager to reduce his mining costs by merely breaking more waste. Again, under such a method, the cost of mining a small streak of ore could easily be made as low as the cost from large deposits; whereas, in all small-streak mines the mining cost must of necessity be high. Furthermore, if such methods were commonly used, the mining costs could be figured so low that prospective purchasers of a mine would imagine there was a liberal margin of profit in mining the ore, whereas actual experience would demonstrate that the ore itself was mined at a loss.

FREDERIC IRWIN.

Dewey, Idaho, June 11.

A Japanese-American electric apparatus manufacturing company has been formed. Information just published in the Japanese press discloses the fact that the Shibaura Works, managed by the Mitsui Co. and the Tokyo Electric Co., will be amalgamated and the General Electric will form a company with four million capital, controlled by the Americans. The General Electric owns a large tract of land at Kawasaki, and it is said that a large factory will be established there.—*Far Eastern Review*.

COMSTOCK BEGINNINGS.

Written for the MINING AND SCIENTIFIC PRESS
By JOSEPH T. GOODMAN.

Commemoration is a duty usually assigned to posterity, but the jubilee anniversary of the discovery of the Comstock will be celebrated the most spiritedly by the very men whose young blood was set astir by the event they commemorate. Their ranks will be thinner and their step less elastic than when they went to the front fifty years ago, but enough of the old guard and of the old spirit survives for them to make a brave and enthusiastic display on this memorable occasion. Of necessity, however, there will be something more than parading and rejoicing. When 'the tumult and the shouting' have died away it will be impossible for the veterans not to be as reminiscent as jubilant. And there will be so much scope for recollection! Little could they have

and the returns from the ore shipped to Swansea, it is doubtful if they would have been encouraged to continue development, for the initial arrastre, patio, and other processes of treating the ore at home, brought but poor results. The working of the mine also was conducted in such a primitive way that, in the light of present methods, it seems pitiable. For more than a year the ore from the Ophir and Mexican mines was brought up in rawhide buckets on the backs of Mexicans, who climbed steps cut in logs placed at an incline from level to level, and all the pumping was done by hand. But the indisputable richness of the ore had created widespread excitement, and every foot of the Comstock, and of the parallel veins, was not only quickly claimed, but doubly claimed in most instances, the locations generally overlapping if not actually overlying each other—a circumstance that gave rise to the expensive litigation in which the principal mining companies were involved for the



Virginia City, Looking South From Cedar Hill.

dreamed that the day of the discovery of that 'blue-black stuff' in Spanish ravine fifty years ago was a moment from which should date a history more wonderful than that of many an empire. Naturally their thoughts will travel back over that history, which itself now seems almost like a dream.

The beginning was so obscure and unnoteworthy—like the germ state of every kind of growth—and everything was so befogged by inexperience and ignorance. Some prospectors working in a ravine cut a mass of blue-black stuff whose character was to them a mystery. A specimen of it sent to California for assay proved it to be silver ore. That did not mean much to the average miner at the time, for few people on the coast knew anything about silver mining; and so distrustful were the discoverers of the value of a silver mine, even when informed of the richness of the ore, that they sold their claim for a mere pittance to capitalists who were willing to venture upon the experiment of working it. The outlook was not promising for these bolder men at the start. Had it not been for the remarkable assays,

first four or five years. Upon the wave of this excitement came the founders of Virginia City in such numbers that from its single saloon and boarding-house tent the place sprang into a town as if by magic. Of course not everybody was at once well housed. There was a brief era of tent and tunnel and almost every other kind of shelter. But the sound of construction was to be heard incessantly, until within three years there arose a city of imposing structures, with a population estimated at 30,000.

Virginia City was incorporated as early as February 1861—only a year and a half after the discovery of the Comstock. She already had an efficient fire department and police force, several churches and places of amusement, and the organization of public schools soon followed. That was quick work for even a frontier settlement. But the city was only keeping pace with the rapid progress being made in the development of the Comstock. The primitive style of mining at first in vogue had given place to a great hoisting works and pumping machinery; Deidesheimer had solved the problem of securely support-

ing the mines by square sets of timber; and it had been decided that it was more profitable to mill all the ore at home than to ship part of it abroad, even if there was a large percentage lost in treating it, and in consequence great reduction works were springing up in every direction. Activity was no longer confined to Spanish ravine, where the Ophir and Mexican works were situated. The Central, Gould & Curry, Savage, Hale & Norcross, Potosi, Chollar—in short, nearly every company on the lode—were getting under way, and some of them on a scale more extensive than had even been dreamed of before. The Comstock and Virginia City had fairly entered upon their marvelous career.

In the full tide into which that career swelled and swept on for years, the eastern slope of Mt. Davidson was the busiest and most picturesque sight ever seen. Immense hoisting works studded the mountain-side for miles, with their huge dump-piles and capacious ore-bins; quartz-mills were thundering and grinding in every available nook of the neighboring canyons; a continuous line of many-mule teams, hauling ore, wood, and merchandise, constantly crowded the streets and outlying roads; and in the town itself were such throngs of people as one would expect to encounter only in the heart of a great metropolis. The scene was made doubly animate by the prevalence of hope and high spirits. Everyone had money, or felt rich from the ease with which money was to be acquired; and all met on an equal footing, for the under one today might be at the top tomorrow. There was a deal of drinking, gambling, shooting, and other indulgences not looked upon with favor in a well-regulated state of society. But, upon the whole, the community was a surprisingly law-abiding one.

Under this careless surface life, as beneath the very ground on which the city stood, a mighty force was ceaselessly at work, with an earnest spirit and purpose. Nevada seems to have been predestined for two great missions. Her organization as a Territory, in 1861, and her admission as a State, in 1864, before she had population enough to entitle her to a single member of Congress, were both essentially war measures; hence she is justly proud of her distinctive title of the 'Battle Born'. The Government needed the assistance of her loyal people in the legislation necessary for the preservation of the Union, and right loyally it was given, together with aid by every other means in her power. In proportion to her population, Nevada sent more men to the ranks and contributed more money to the Sanitary fund than any other Territory or State; she was the first to ratify the Constitutional Amendments that secured the fruits of the war and cleared the way for reconstruction; and the output of treasure from her mines was a principal factor in sustaining the national credit. The importance of that product, in the estimation of the greatest and wisest statesman of that time, is shown by the words of Abraham Lincoln on two occasions: "I am glad to see you here," was his first greeting to Senator Stewart; "we need as many loyal States as we can get; and, in addition to that, the gold and silver in the region you represent has made it possible for the Government to maintain sufficient credit to continue this terrible war for the Union."

And the very day he was assassinated he requested Speaker Colfax, who was about to visit the Pacific States, to carry a message from him to the miners. "Tell them," said Mr. Lincoln, "that during the war, when we were adding a couple of million dollars a day to our national debt, I did not care about encouraging an increase in the volume of our precious metals; we had the country to save first; but now that the rebellion is overthrown and we know pretty nearly the amount of our national debt, the more gold and silver we mine will make the payment of that debt so much the easier." True to the expectation and trust of the martyred President, Nevada has never ceased pouring out a stream of treasure to aid the Nation and enrich the world, though in her munificence the generous State has left herself comparatively poor.

A mission of almost as much importance, and as faithfully performed, was the guidance the Comstock was destined to give to the mining industry of the world. The experience gained in working that lode revolutionized mining on a large scale, and practically created the science as it is known today. From every quarter of the globe where extensive operations have been projected a demand has come, and is still coming, for engineers and workmen skilled or schooled in the methods and machinery of the Comstock. There is a significant promise in the fact that for fifty years the great lode has pioneered the way for others to follow. The genius and determination that overcame every obstacle in the past should be equal to the problems of the present and the future, hence it is only reasonable to hope that the mission of the Comstock will not be entirely fulfilled until an example is set of successful silver mining at a depth never before attained.

The restrictions of time and space preclude anything like a full review of the past fifty years of the Comstock and Virginia City—the fluctuations in the fortunes of the mines, the vicissitudes in the life of the town, the changes wrought by the railroad, the great Sierra water-system, and the introduction of electric power—but even a cursory notice would be incomplete without mention of some of the men whose names will remain most closely connected with their history. In that regard, precedence should probably be given to those who controlled the mines, and thereby to a great extent shaped the destinies of the lode and the community. The first of these, in point of time as well as of executive ability, was William Sharon. He went to Virginia City in 1863 to establish a branch of the Bank of California. The bank and the capitalists associated with it already controlled the principal mines, and Sharon soon devised a way by which he and a few others became the owners of a majority of the mills as well. Quite a number of men had built what are termed 'custom-mills', that is, they had no mines of their own, but worked ore for any company that would furnish it. Most of them, however, had involved themselves and were in need of financial aid, and Sharon, as manager of the branch bank, generously came to their assistance. But no sooner had they secured a loan than their supply of ore was cut off, and as a matter of course their mills in due time fell into the hands

of the bank. These properties, however, did not go into the assets of the bank for the benefit of its stockholders. They were taken out by Mr. Sharon and his friends and organized into the Union Mill & Mining Co., which thenceforward became an instrument for absorbing the wealth of the Comstock mines. If a mine had a rich body of ore, more than an equal share of waste rock was mixed with it to feed the insatiable maw of the great milling company; if the ore was poor, the stockholders were assessed to make up the deficit in the cost of reduction.

Such was the general condition of things under the Sharon régime, relieved only by a few companies which independently managed their own affairs, notably the Crown Point, that under the control of Alvinza Hayward and John P. Jones developed one of the greatest bonanzas in the history of the Comstock. But two comparatively obscure men, John W. Mackay and James G. Fair, both practical miners, and familiar with every inch of the lode, had quietly been getting a line on matters, and in conjunction with James C. Flood and William S. O'Brien, of San Francisco, they wrested the control of Hale & Norcross from Mr. Sharon and his friends, in 1868, and quickly turned it from an assessment to a dividend-



Divide From Wheeler Monument.

paying mine. That was the first appearance of the great Bonanza firm upon the scene; but their uncovering of the immense orebody in the Consolidated Virginia and California a few years afterward, and the enormous fortunes realized from it, thenceforth left them undisputed masters of the Comstock, until death or voluntary retirement put an end to their reign. It would be difficult to say if in the long run stockholders fared better under any one of these managements than under the others.

Probably the lawyers constituted the next most noteworthy class of men in the early history of the Comstock. It has been estimated that \$10,000,000 was the cost of litigation within five years from the discovery of the lode. That implies either an extraordinary quantity or quality of legal talent, and Virginia City had both. There was scarcely a California lawyer of prominence who did not establish himself there or form a partnership through which his services might be enlisted in the great mining cases. It would be invidious to cite a few out of a list of more than a hundred, but there was one who deserves particular mention, William M. Stewart. Not that he was superior to many others in professional ability, but his force and integrity of character inspired a confidence that raised him to the position of legal

representative of all the Comstock mining companies, and it was by his efforts that the rules and regulations of the miners were crystallized into statutory form and became the law of the land. Nor is this all for which Nevada is indebted to Senator Stewart. It was through his untiring zeal and energy that she acquired her enlarged boundaries; that by the exchange of the worthless sixteenth and thirty-sixth sections for valuable lands she was endowed with her magnificent school fund; that the land-grant and annual appropriation were obtained for the support of the State University and the Agricultural Experiment Station; and that the Government provided for the establishment and maintenance of the Indian school at Carson. Not only the miners of Nevada, but the people of whatever occupation, owe more to the late William M. Stewart than to any other man who ever lived in their State; and it would be a crowning act of this memorial occasion to take some step toward erecting a worthy monument to his memory.

Of less influence in their day than any of those mentioned, but of more importance in perpetuating the fame of the city and the lode, were two young men employed in the humble capacity of reporting for one of the daily papers, the *Territorial Enterprise*. The name of one, Samuel L. Clemens, or Mark Twain, is now the foremost in the world of literature. That of the other, William Wright, or Dan de Quille, is scarcely known away from the Pacific Coast, but of the two he performed the greater service for Virginia City and the Comstock. Mr. Clemens came on the scene in 1862, and remained until 1864, a period just covering the palmiest days and the most riotous life in the history of Virginia City. He was then only a literary beginner, and it was there that he assumed the pen-name he has made immortal. The reckless, rollicking, tragical sights he daily witnessed thrilled every nerve in him and schooled him into that irreverent and humorous way of dealing with facts, and that scorn for sham, which have been his stock in trade ever since. He has never pretended to write an accurate account of his sojourn on the Comstock, but so thoroughly impressed was he by his experience there that in 'Roughing It' he has caught the spirit of the tumultuous, graceless life of those early days, and has given a better presentation of it than any one who has ever attempted to reproduce it. Dan de Quille was a more matter-of-fact and plodding man than Mark Twain, though possessing quite as rich a gift of humor. He was acquainted with the Comstock almost from the date of its discovery, and probably there was never another man in Nevada who had so exact a knowledge, and who kept so close an account of the condition of every mine on the lode, as he did for more than twenty-five years. He was an unusually keen observer of persons and incidents and everything else that came within his range of vision, and he had moreover a wonderfully retentive memory. The store of information acquired by him in the course of time was embodied in his book, 'The Big Bonanza', the completest account of the Comstock lode and Virginia City ever written, and a work that will forever remain the great repository of facts relating to them.

DISCOVERY OF THE GREAT COMSTOCK MINE.

By DAN DE QUILLE.

*In the spring of 1859 Peter O'Riley and Pat McLaughlin set to work well up at the head of Six Mile canyon near Gold Hill. They used rockers and found small pay. They continued to work at this point until June 1, 1859, gradually extending their operations up the slope of the hill. They had started a little cut or trench and were washing the dirt taken from this in their rockers. Before they started the cut they were making only from \$1.50 to \$2 per day; in the cut their pay was even less. They were becoming discouraged, and were thinking of going to Walker river to try their luck, but concluded to work on where they were a few days longer.

Having but a small stream of water, it became necessary for them to dig a hole as a sort of reservoir, in which to collect it for use in their rockers. They set to work a short distance above to make the water-hole, and at a depth of about four feet struck into a stratum of the rich decomposed ore of the Ophir mine, and of the now world-famous Comstock silver lode. What they found was not glittering native silver, but a great bed of black sulphuret of silver—a decomposed ore of silver filled with spangles of native gold. This gold, however, was alloyed with silver to such an extent that it was more the color of silver than of gold. The gold dug in the placer-mines of California is worth from \$16 to \$19 per ounce, whereas the gold taken from the croppings of the Comstock was worth no more than \$11 or \$12.

When the discoverers struck into the odd-looking black dirt, they only thought that it was a sudden and rather singular change from the yellowish gravel and clay in which they had been digging. As any change was welcome, they at once concluded to try some of the curious-looking stuff in their rockers. The result astounded them. Before, they had only been taking out a dollar or two per day, but now they found the bottoms of the rockers covered with gold as soon as a few buckets of the new dirt had been washed. They found that they were literally taking out gold by the pound. However, as the gold they were getting was much lighter in color and weight than any they had found below in the canyon, or even on the surface in their cut, they began to fear that all was not right. They thought that, after all, what they had found might be some sort of 'bogus stuff'—base metal of some new and strange kind. It is not strange that these impecunious miners, tinkering away there on the side of a lone, sage-covered mountain, with their rockers, should have felt a little alarmed on account of the great quantity of gold they were getting, as in a few weeks after the discovery had been made they were taking out gold at the rate of \$1000 per day. This they were doing with rockers. Taking the harder lumps left on the screens, one man was able to pound out gold at the rate of \$100 per day in a common hand-mortar.

In the evening of the day on which the grand discovery was made by O'Riley and McLaughlin, H. T.

P. Comstock made his appearance upon the scene. 'Old Pancake', who was then looking after his Gold Hill mines, which were beginning to yield largely, had strolled northward up the mountain, toward evening, in search of a mustang pony that he had out prospecting for a living among the hills. He had found his pony, had mounted him, and with his long legs dragging the tops of the sage-brush, came riding up just as the lucky miners were making the last clean-up of their rockers for the day. Comstock, who had a keen eye for all that was going on in the way of mining in any place he might visit, saw at a glance the unusual quantity of gold that was in sight. He was off the back of his pony in an instant and down in the thick of it all—'hefting' and running his fingers through the gold, and picking into and probing the mass of strange-looking 'stuff' exposed. Conceiving at once that a wonderful discovery of some kind had been made, Old Pancake straightened himself up, from a critical examination of the black mass in the cut, and coolly proceeded to inform the miners that they were working on ground that belonged to him. He asserted that he had some time before taken up 160 acres of land at this point, for a ranch; also that he owned the water they were using in mining, it being from the Caldwell spring, in what was afterward known as Spanish ravine.

Suspecting that they were working in a decomposed quartz vein, McLaughlin and O'Riley had written out and posted up a notice, calling for a claim of 300 ft. for each and a third claim for the discovery; which extra claim they were entitled to under the mining laws. Having soon ascertained all this from the mine before him, Comstock would have 'none of it'. He boisterously declared that they should not work there at all, unless they would agree to locate himself and his friend Manny (Emmanuel) Penrod in the claim. In case he and Penrod were given an interest, there should be no further trouble about the ground. After consulting together, the discoverers concluded that, rather than have a great row about the matter, they would put the names of Comstock and Penrod in their notice of location. This being arranged to his satisfaction, Comstock next demanded that 100 ft. of ground on the lead should be segregated and given to Penrod and himself for the right to the water they were using—he stoutly asserting that he not only owned the land, but also the water, and, as they had recognized his right to the land, they could not consistently ignore his claim to the water flowing upon it. In short, he talked so loudly and so much about his water-right that he at last got the 100 ft., segregated, as he demanded. This 100 ft. afterward became the Spanish or Mexican mine, and yielded millions of dollars.

Comstock would probably not so easily have obtained what he demanded, had the men who made the discovery been fully aware of its great value. They, however, did not know that the 'blue stuff' (sulphuret of silver), which they had dug into, was of any value, and even the gold itself seemed altogether too plentiful as well as a good deal 'off color'. Comstock had probably at some time posted up a notice claiming 160 acres of land, somewhere in that neighborhood, as a ranch, but if he did so he never had his

*From 'The Great Bonanza', by Dan De Quille (Wm. Wright), 1876.

notice recorded. Men in those days, while roving about the country, frequently wrote out and stuck up notices claiming land, springs, the water of streams, quartz veins, gravel deposits, or anything else that they might for the moment think valuable, but unless such claims were properly recorded and worked they could not be held, as all miners and others well knew—a mere notice expiring at the end of 10 days, when the property might be taken up, recorded and held by the first man that came along. Comstock had some show of right to the water and to the placer-mines along the upper part of Six Mile canyon, as the year before, he, Old Virginia, and Penrod had bought of old Joe Caldwell a set of sluice-boxes and the water of a spring. However, the possession of a set of sluices on the canyon and a right to use water from a certain spring in the neighborhood, by no means gave Comstock or his friends the right to lay claim to a vein of quartz found in a hill somewhere in their section of the country.

John Bishop, who bought Old Virginia's interest in the sluices, gravel-diggings, and water, got no share of the quartz vein discovered by Pete O'Riley and Pat McLaughlin, though he managed to get in on the lead, locating the mine known as the Central No. 1; now a part of the California, one of the bonanza mines with millions of ore in sight. Bishop put up the first arrastre ever built on the lode, starting it up two or three days before that of the Ophir began running. He sold his interest in the Central No. 1 for \$4000, and shortly afterward the purchasers sold the same ground for \$1800 per foot—now (as incorporated in the California mine) the ground is selling at over \$50,000 per foot, and John Bishop still works, as a miner, at Gold Hill.

After Comstock had managed to become largely interested in the new discovery, and after the gold taken out by O'Riley and McLaughlin had been carried down to Gold Hill and exhibited and examined, there was at once a great local excitement in regard to the new diggings, and all were anxious to get an interest in the claim, or on the lead as near to the original discovery as possible. Those who were finally recorded in the Ophir notice as original locators were the following persons: Peter O'Riley, Patrick McLaughlin, H. T. P. Comstock, E. Penrod, and J. A. ('Kentuck') Osborne. The men named had one-sixth each of 1400 ft. of ground on the lead and, in addition, Comstock and Penrod had 100 ft. segregated to them, making 1500 ft. taken up by the party. The 100 ft. of Comstock and Penrod, though in the midst of the 1400 ft. of ground, was not reckoned as a part of the Ophir claim and was soon sold and worked as a separate mine, under the name of the Mexican or Spanish mine. The Ophir claim was the first that was located, as a quartz claim, at any point on the Comstock lode, though as early as February 22, 1858, Old Virginia (James Finney or Fennimore) made a location on a large vein lying to the westward of the Comstock. This vein is known as the Virginia lead or Virginia croppings. It has never yielded much ore, but contains vast quantities of base metal of various kinds. At one time it was thought by some that this would prove to be the main or 'mother' lead of the range, as at the surface, and for

a considerable distance below the surface, the Comstock vein dipped west toward it. Parties bought Old Virginia's claim, and began suit against the Ophir company, asserting that the lead on which they were at work was the same as that located, in 1858, by Old Virginia. It was a sort of speculation on the part of those who brought the suit, and it is understood that they succeeded in obtaining \$60,000 from the Ophir company. At the beginning of this suit it was necessary, if possible, to produce the original notice placed upon the croppings of the lead by Old Virginia, but the parties to whom he had sold his claim could never get him sufficiently sobered up to show where it could be found. Growing desperate, they at length seized the old fellow one evening, and thrusting him into the mouth of a big tunnel, closed and locked upon him a heavy iron gate. The next morning when they went to the tunnel they found Old Virginia sober, but very savage. He would say nor do nothing until they had taken him down town and given him half a tumbler of whiskey. This swallowed, he was ready for business. He marched directly up the side of the mountain, and going straight to a large tower of croppings, drew out a small block of rock, and lo! behind it was seen snugly stowed the much-desired notice.

It was probably on account of his having made this location that Old Virginia was given the credit of having been the discoverer of the Comstock lode, his interest in which he was said to have sold for an old horse, a pair of blankets, and a bottle of whiskey. He sold a third interest in the sluices, water, and diggings in the canyon to John Bishop, for \$25. James Hart, who had an interest in the sluices, and diggings in the canyon, sold his right to be 'considered in' on the big discovery to J. D. Winter, of Washoe Valley, for a horse and \$20 in coin.

MINERAL DEPOSITS IN FIJI.

Prospects of future importance as a mineral producer are apparently turning the thoughts of the colonists of Fiji from the production of copra and sugar cane. There seems to be some doubt yet as to what the mineral deposits actually consist of, but reports are to the effect that copper, gold, and silver have been found. The existence of tin is also suggested. The assay returns of a 15-ton parcel sent to Sydney for treatment, it is said, gave a valuation of 40% copper and $2\frac{1}{2}$ oz. of gold, with a certain amount of silver. To what extent this result is to be relied upon, and what is the bulk of the deposits of this richness are matters too risky to forecast, but it can be safely prophesied that, if there is much of such ore, the copra and sugar cane growing industries will soon be relegated to places of minor importance. The prospects of the colony from the mining man's point of view have at least drawn the attention of Western Australian mining men, and The Fiji Prospecting & Option Syndicate has been formed to verify or refute the statements as to the mineral wealth of this portion of the South Sea Islands. Several Western Australian mining men are responsible for the formation of this pioneer venture, and they are now in Fiji.—*Australian Mining and Engineering Review.*

THE COMSTOCK MINES TODAY.

Written for the MINING AND SCIENTIFIC PRESS
By WHITMAN SYMMES.

It is just fifty years ago since a few placer miners, working up the gulches from the Carson river, found their 'pay' stop at the outcrop of the Comstock Lode. During that time mining on the lode has swung through a complete cycle, and its semi-centennial witnesses the fact that deep mining is being re-established, and along successful lines. It is interesting to note that one of the little party of the lode's discoverers, E. Penrod, is still alive and still a mining man, and that he will leave his claims in Mono county to attend the Comstock Golden Jubilee.

The policy that is now being pursued in unwatering the mines is radically different from that followed

plishes a double purpose. A drift that is dry can soon be cooled by ventilation, but when steaming water is dripping from the roof of the drift it brings in so much heat that a proper reduction of temperature is impossible, even though the 'snowshed' method of lining the drift be adopted. A year ago the 2250-ft. level of the Consolidated Virginia was hot and steaming, but since the 2350-ft. level has been run beneath, it has become a cool drift, and its 'snowsheds' are no longer kept in repair. The method of exploring coincidentally with complete drainage has already brought important results. In the first attempt at exploration of the deeper levels of the north end it was repeatedly announced in the reports that the drifts were kept to the west for fear of encountering too much water. It is now proved that those drifts were also kept too far west to penetrate the



Ophir

Union Con. Va.

C. & C. Shaft

Virginia City From the Outcrop of Comstock Lode.

in the early eighties. The pumping plants at that time being insufficient to completely unwater the lower levels, it became customary to bulkhead the wet drifts, plug the diamond-drill holes that had struck water-seams, and confine exploration to the drier portions of the lode. This method was, of course, doubly disastrous. Not only did the miners have to retreat from those areas that were wet, and therefore fissured and most likely to contain ore, but the water that was held back by the bulkheads soon found its way to the levels below, whence it required more power to lift it to the surface. The pressure of the water above also increased the liability to the sudden 'rushes' that so frequently overwhelmed the pumps.

The opposite policy has now been adopted. The lode will be drained, level by level, in advance of the exploration for orebodies. Complete drainage accom-

plishes a double purpose. Since 1903, when the water at the C. & C. shaft was first lowered sufficiently, several million dollars have been extracted from the Consolidated Virginia and Ophir mines between the 1900 and 2300-ft. levels.

Thus far the only area to be drained is that adjacent to the C. & C. shaft, at the north end of the lode. The Ward shaft has reached a depth of 2560 ft., and a drift now being started on the 2450-ft. level will ultimately be connected with the Combination shaft, and will thus drain all of the middle mines to that depth. It is intended to begin the drainage of the southern portion of the lode as soon as the principal Gold Hill mine-workings are cleared as far down as the Sutro Tunnel level. This will be at no distant date.

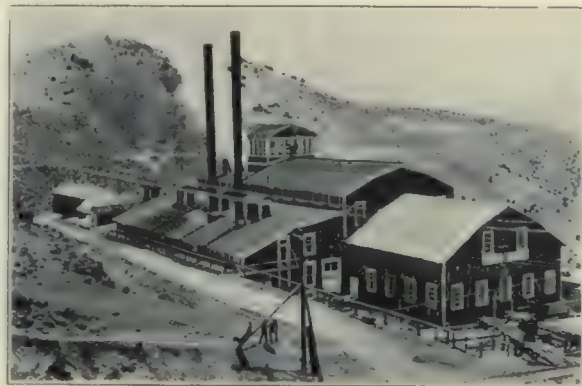
At the north end the water now stands a few feet below the 2450-ft. level, corresponding to the 2300-ft.

level in the Ophir. Everything is on hand to take the water down to the 2650-ft. station, which is the bottom of the shaft. A 30-in. wooden-stave pipe is being installed in the Sutro Tunnel to carry the drainage from the mines, and more than half of it is already in place. As soon as this is completed, it is intended to begin sinking in the C. & C. shaft, instead of opening up the levels below that point by a complicated series of winzes, as was formerly done. The fire in the Sutro Tunnel last January was a great misfor-

now being energetically prospected. Also the Bulion, Chollar, Potosi, Julia, Hale & Norcross, and the Savage will at no distant date be enabled to resume deep-level exploration from the 2450-ft. drift which is now starting from the Ward shaft. The upper levels of the Gold Hill mines are being re-opened, and the Crown Point is now being explored on the 1100, and the Yellow Jacket on the 1200-ft. level. The Yellow Jacket mill is working the so-called 'gold ledge' and is today extracting about 80% from a \$6 ore by



Butters Cyanide Mill.



Ward Shaft.

tune to the mines, as it not only entailed a heavy expense, but also delayed the installation of this pipe. Therefore the further lowering of the water at the north end was also delayed. The mine-water is now lifted to the Riedler pumps on the 2150-ft. level of the C. & C. shaft by means of a jet-pump, and the cold pressure-water from the Virginia & Gold Hill Water Co.'s ditch serves to lower the temperature of the mine-water, with which it mingles. When the stave-

concentration alone. The principal Gold Hill mines are now so nearly able to pay expenses that their manager, George S. Sturges, has hopes of getting them upon a self-sustaining basis as low-grade properties. The water-level is between the 1400 and 1500-ft. levels, and considerable low-grade ore is believed to remain on upper levels. No work has been done below the 1400-ft. level in Gold Hill since the flood of 1882. The best producer on the lode is still the

Ophir. During the past year the milling ore has averaged about \$30 per ton, and the shipping ore \$80. About one-half the value is in gold, and the other half in silver. Charles Butters & Co., Ltd., have leases on the upper levels of the Chollar and Potosi mines. They are extracting ore by ordinary mining methods and by means of 'glory holes' along the outcrop. As they pay royalties on ore assaying as low as \$4 per ton, it is believed that they can mine, transport the ore two miles by aerial tramway, and cyanide it in their mill for about \$3.50 per ton. They are undoubtedly now mining and cyaniding a gold-silver ore at a lower cost than any other company in the State of Nevada. At present the Chollar and Potosi



Interior of California Pan Mill.

pipe is finished, it will be possible to pump direct from the sump to the Sutro Tunnel. If this were now done, the hot water, flowing through the tunnel in the open, would so heat it as to make necessary repairs impossible. The Ward shaft is now sinking through a 'pocket' of hot water of 163° F., and is pumping direct to the tunnel without mixing its drainage with cooling-water. At present it affords only about 300 gal. per minute, against the 2300 gal. of hot water that is coming from the C. & C. shaft.

A year ago no miners were employed in active exploration for ore in the Mexican, Crown Point, or Belcher. At these important old mines the ground is

outcrop affords them about 200 tons per day, which amount will soon be largely increased. They are also milling ore from the Ophir and the Consolidated Virginia mines. In the bonanza days at the Comstock pan-amalgamation was developed, and reached there a state of perfection which won it world-wide acceptance for the treatment of ores rich in silver sulphides. It was known as the Washoe process, in consequence of its Nevada origin. In effect it was an adaptation of the old patio process of Mexico. Instead of waiting for the slow reactions occurring in a *torta* or mass of pulp containing silver sulphide, to which copper sulphate and salt have been added, the

mass is ground and agitated in a grinding-pan, the reactions being hastened by the injection of live steam. Thus the work which required two weeks in the patio was accomplished in several hours in the pan. The process is now being superseded everywhere by cyanidation, and it will soon become interesting only to the metallurgic antiquary. The interior of one of the old Comstock mills, the California, is shown in the accompanying illustration.

The Ward shaft pumping plant is designed to be the largest of any precious metal mine in the United States. One 800-hp. unit now temporarily installed on the 2475-ft. station is direct-connected to an electric motor and runs at a speed of 196 revolutions, or 523 ft. of plunger speed per minute. The behavior of this pump in a long test by practical operation will have an important effect upon the future design of large electrically driven mine pumps in this country.

During the past few years a great deal of necessary 'dead work' has been accomplished. The men on the Comstock believe that the fiftieth anniversary of the discovery of the lode marks also the date of its substantial rehabilitation, and that the mechanical and metallurgical improvements which have lately been made there will enable the miners of today to work the low-grade ores and to explore in search of bonanzas those portions of the lode which the men of thirty years ago were unable to enter.

JEFFERSON CANYON, NEVADA.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE A. PACKARD.

In Nye county, Nevada, five miles easterly from the new camp of Round Mountain, and 50 miles north of Tonopah in an air-line, is the old camp of Jefferson. For nearly forty years the stage from Austin to Belmont followed the road up Jefferson creek from the Big Smoky valley to the summit of the Toquima range, but after the opening of the mines of Manhattan and the discovery of Round Mountain, the route was changed, and a detour made to the south to include these places. During the seventies several mines were worked in Jefferson canyon, which was then known as the Concordia or Green Isle mining district. The largest producers were the Jefferson and the Prussian companies, owning adjoining claims, the Prussian South and Prussian, on the same lode. This vein has a northwest strike, with a dip to the northeast of about fifty degrees, and has been traced for several thousand feet. It lies between a porphyry hanging wall and a slate foot-wall, though the occurrence of slate is limited. To the southwest quartzite may be seen overlying limestone, and this in turn lies upon granite. In passing up Jefferson canyon this hanging wall porphyry shows two rocks quite unlike in appearance, one a very light brown, the other gray in color. Microscopic examination of slides shows, however, that these are not materially different. Both may be termed rhyolite, and show a strongly marked flow-structure, as does the country rock at Round Mountain, which they closely resemble. The darker shows, with the high powers, a ground-mass, once glassy, of indistinct crystals crowded with decomposition products

such as kaolin and calcite. The quartz phenocrysts, which are fairly abundant, are large, and are generally somewhat rounded crystals. More abundant than these are the crystals of albite, now largely replaced by calcite. The rock also shows orthoclase, biotite altered to chlorite, and grains of magnetite. The ground-mass of the lighter rock is similar to that of the darker, except that it is more discolored with ferruginous matter, which also appears in the phenocrysts. There is somewhat less calcite.

Alexander Trippel, reporting on the Jefferson and Prussian properties in 1881, says: "It has been stated that the two mills shipped a million dollars worth of bullion; for the absolute truth of this statement I cannot vouch, but to my own personal knowledge \$200,000 worth was produced during one year. Both companies worked their mines by means of inclined shafts sunk on the vein, the Jefferson company to the depth of 700 ft., and the Prussian to the depth of 250. The width of the vein varied from 2 to 7 ft., with a smooth and regular wall on either side. The ore was not uniformly distributed, but was found in obliquely inclined chimneys several hundred feet in length, between which the vein was either low grade or barren." These properties have not been worked since 1876, except for a short time by lessees. Apparently they were closed because in depth the amount of water increased and the ores became too 'base' to work by methods then known. The ore in this vein contained silver chiefly, and at water-level sulphides and sulphantimonides were found.* In the hanging wall porphyry are a number of veins which have been held and worked by a single miner for over thirty years. Some of these parallel the Prussian vein, but others are apparently nearly at right angles. In doing some 4000 ft. of work, ore yielding many thousand dollars has been sorted and shipped, but the bulk of the ore is comparatively low grade. Recently two New York men have acquired control of this property, and are erecting a mill. This ore differs from the ore of the Prussian contact-vein in that it carries more gold than silver, though the proportion of silver is larger than in the ore occurring in the similar porphyry at Round Mountain. There is also some work being done to the southwest of the Prussian vein, on the contact of the granite and sedimentaries.

Wireless stations are to be erected in the interior of China. The difficulty of establishing communication by telegraph across the deserts between Peking and the extreme northwest of the Empire is to be surmounted by the installation of an extensive wireless system under the control of the Chinese Government. The Board of Posts and Communications is now making investigations as to the best system to adopt.—*Far Eastern Review*.

The lower limit of manganese steel is determined by the fact that alloys between 7½ and 5½% of manganese are weak and brittle. The characteristic strength and toughness can only be given to steels having more than 8 per cent.

*Mineral Resources of the United States, 1875, p. 281, and 1876, p. 138.

COMSTOCK DRAINAGE PROBLEMS.

Written for the MINING AND SCIENTIFIC PRESS
By LEON M. HALL.

The first mining of any magnitude on the Comstock was upon the orebodies adjacent to the surface or embraced directly within the outcrop of the vein.



Consolidated Virginia Shaft.

From the surface the lode paid handsomely, and the early development brought forth the great bonanzas. These were enormously rich and of large extent, but they were soon denuded of the masses that could pay by the crude methods then in vogue. Between these orebodies and the deposits unearthed in the Bonanza mines, the Belcher and Crown Point, there was a zone of barren or low-grade quartz, which is usually the case in all gold and silver lodes. The second line of bonanzas has been practically exhausted; at any rate, down to the depth of the Sutro Tunnel. When operations were discontinued, the workings were in the second zone of barren quartz, and while no rich bonan-



Pumping Engine, Yellow Jacket.

zas were then in sight, there were no discouraging features developed; on the contrary, in many parts the prospect was bright. The indications in both the Hale & Norcross and the Belcher pointed to a large deposit at no great depth below the workings at that time. The Yellow Jacket (Taylor shaft) passed through the vein at about the 3000-ft. level, and here the foot and hanging walls were 60 ft. apart,

with an unusually promising body of quartz between them.

It was about this time (February 13, 1882) that an immense reservoir of exceedingly hot water was encountered on the 2700-ft. level of the Exchequer. This was of such volume that the appliances then extant were entirely inadequate to handle the river that was pouring into the Gold Hill mines. In the middle and north-end mines the state of affairs was different. New shafts had been sunk to the east of the second line of workings, and a vast amount of prospecting was being done, when orders came to abandon deeper mining and to return to the ore left behind, in the search for new and possibly vaster deposits. At the time when work was discontinued in the deep shafts and a return was made to operating the upper levels, the Combination shaft, then one of the deepest vertical shafts in the world, had reached a depth of 3250 ft., and the Yellow Jacket a depth of 3000, the Sutro Tunnel intersecting the former at a depth of 1590 ft. and the latter at about 1513 below the



Head-Frame, 80 Ft. High, Forman Shaft.

surface. A similar ratio existed in all of the deeper mines. Thus, with the advent of the Sutro Tunnel, a new and lower working-surface was created, and the depth for operating was virtually reduced about 1500 ft., making it possible to sink to the 3000-ft. from this level with the same facility as was formerly done from the surface.

During this period all of the principal shafts on the Comstock were equipped with magnificent hoisting plants, some of which were capable of operating to a depth of 4000 ft. Among the most notable may be mentioned the large first-motion engines that were installed at the Yellow Jacket and Union shafts. These hoists consisted of double 30 by 96-in. engines, equipped with

flat-rope reels and a flat rope 8 in. wide. They were capable of making the trip from the 3000-ft. level with a load of 10 tons in one minute. At many of the other shafts large geared hoists were installed, which, together with numerous large air-compressors and the attendant necessary boiler-plants, made an imposing equipment. At several of the more important shafts it was not an uncommon

occurrence to consume 60 cords of wood per day.

Nearly 20 years have now elapsed since most of the largest mining plants for the Comstock were planned and installed. Criticism of the past from the standpoint of today, with the experience and advancement made in all pumping appliances before us, is liable to be harsh and unjust. The defects are readily seen, while the causes that led to them are forgotten. Furthermore, nearly every system as planned in practice falls short of its calculated efficiencies, and is handicapped and confused by the multiplicity of commercial interests involved, and no mining district has had greater difficulties to contend with in pumping than were met by the engineers on the Comstock Lode.

The completion of the Sutro Tunnel, and its employment for drainage purposes by the several companies, changed nearly the whole system of pumps as originally designed. The costly and massive pumping engines were left on the surface, while all intervening pumps were removed to below the tunnel-level, where they were doubled up, two being placed at each tank-station. This change left about 1700 ft. of heavy pump-rods between the surface engine and the first set of pumps. Double the work was being done on the lower end of the rods that was originally intended, and the fibres of the rods became fatigued and over-strained. Velocity diagrams taken from the pump-rods underground showed that their motion was not regular or uniform with the surface engines. The effect of the elasticity, and the great length of the rods, produced accelerations and consequent strains that many times exceeded the direct strain due to pumping alone. In the case of the Ophir rod at the 2400-ft. level, strains were found that exceeded the proper one by over nine times. The cause for the constant need of renewing pump-rods, broken balance-bobs, pins, and strapping plates, that was almost a weekly occurrence, was thus made apparent. As for the remedy, there was none with that class of pumps and machinery, necessarily placed at such a great distance from the water to be pumped.

For the benefit of those not familiar with the magnitude and the extent of the pumping plants erected and operated on the Comstock up to the year 1886, a brief description is here given, as it will enable them to better understand the reasons for some of the enormous expenditures in pumping in the past, compared with what is being accomplished at the present time. The Mexican-Union pumping engine was originally built in Europe as an overhead-beam Cornish engine. It was brought over, re-built, and changed to the compound condensing fly-wheel type. The cylinders were placed over the main beam, and inclined to each other with their connecting rods attached to the beam, one on each side of the beam-centre. The pump-rod was connected at the pit end, and the connecting rod of the fly-wheel at the other. The fly-wheel was 36 ft. diam, and weighed, with the shaft, 208,700 lb. The wrought-iron beam under the cylinders was 22 ft. long between the pump and the fly-wheel pins, and weighed, when completed with braces, 238,610 lb. The high-pressure cylinder had a diameter of 64 in. and a stroke of 6 ft. 9 in. The low-pressure cylinder was 100 in. diam and 8 ft. 6 in.

stroke. The air-pump was single-acting, 54 in. diam. and 6-ft. stroke. The nominal stroke of the pump was 10 ft. The engine was first started in April 1880, with a double line of 14-in. plunger-pumps discharging into the Sutro Tunnel. In January 1883 the 14-in. pumps were replaced by 10 plungers 17 in. diam. In making this change a thousand feet of new 18-in. pump-rods, with extra strapping plates, were put in. The pump-rod, from the surface-bob to the 2700-ft. level, was 2618 ft. long, and was counterbalanced by means of nine balance-bobs, with from 18 to 20 tons in each bob. The total weight in motion while pumping was 1,620,500 lb., or about 620 lb. for every foot of pump-rod. The total lift from the pump at the 2700-ft. station to the lateral drift of the Sutro Tunnel was 1180 ft. On account of the great length, elasticity, and weight of the pump-rod, the actual strokes of the plungers averaged by measurement 9.7 ft., when the surface stroke was 10 ft. A similar loss of stroke was noticed on all the Cornish pumps in use on the Comstock.

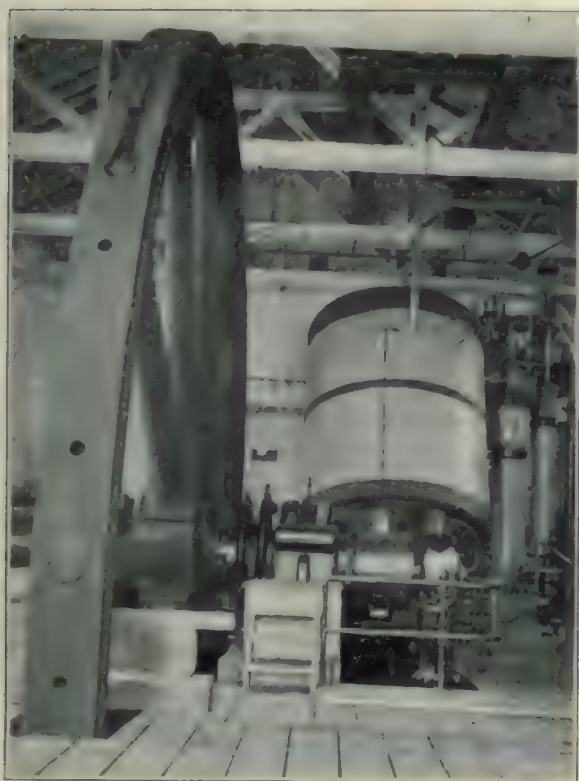
The hydraulic system installed and started at the Combination shaft in May 1881 consisted of a surface pumping engine, compound-condensing type, with horizontal cylinders, actuating direct from the cross-head four pumps with plungers 8½ in. diam. The stroke, designed for 10 ft., was variable under the control of the Davey valve-motion. These pumps forced the water into a large surface air-chamber, and from there down the shaft to the underground hydraulic pumps. The cylinders of this engine were 30 and 70 in. diam., respectively. An air-pump and cooling pond were used for condensing purposes. In each of the underground stations, cut at the 2400, 2600, and 3000-ft. levels, as the shaft was sunk there were placed two hydraulic engines. Each engine had four power-plungers of proper size to operate two pump-plungers that raised the water from the station to the Sutro Tunnel discharge. The ratio of the power-plungers to the pump-plungers was properly proportioned so that for a 10-ft. stroke the pumps could make about six or seven strokes per minute. After a trial of a few months, with numerous breaks and want of satisfactory results as to efficiency, the use of the surface-power engine was abandoned. A 12-in. pipe was laid from the Virginia & Gold Hill Water Co.'s tank near their flume, which gave a pressure-head of 2016 ft. to the Sutro level. With this steady power the pumps worked smoothly, without a jar, and gave quite efficient results. Under this system of pumping, all the water used for pumping was discharged with the mine-water through the Sutro drain.

At the Yellow Jacket, Belcher, Overman, Alta, Ophir, C. & C. shafts, and at several other points, large Cornish pumps were installed and gave fairly efficient service until their capacity was greatly over-taxed. All of the above-mentioned pumping machinery cost, without foundations, installation, or freight, about \$1,300,000. Its maximum pumping capacity, all told, was less than 5400 gal. per minute, lifting an average height of 1152 ft. The cost for six months, taken from the books of the different companies, for operating the same was \$34.13 for each indicated horse-power per month. The average water pumped

during that time was 5040 gal. per minute, raised an average distance of 1074 ft. The total indicated horse-power was 1703. The cost per month was \$58,120, or \$697,440 per year. This does not include the cost of new fly-wheels, broken bobs, strapping-plates, pump-rods, or new plungers, but represents the daily operating expense for pumping.

As for the enormous cost of operating expenses, it must be borne in mind that a great part was due to the local conditions, not to be found in any other mines the world over, hot water often reaching 160° F., at an elevation of 6000 ft. above the level of the sea. Ice was one of the staples in the list of supplies and lubricants for plungers, and all under-

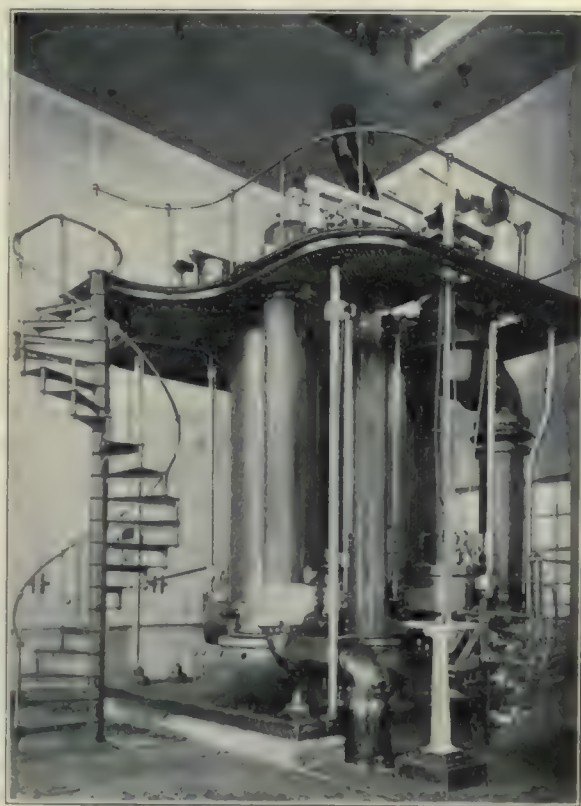
ciency is only about 25% at best, but the cost of repairs is very small and the reliability superior to other systems. At a depth of 450 ft. below the Sutro Tunnel level the limit of power from the water-supply was reached, and on the 2150-ft. level a large electrical pumping-plant, with a capacity of 4500 gal. per minute, was installed. This plant consists of three duplex, double-acting ($6\frac{11}{16}$ by 24-in.) pumps, driven by three 225-hp. Westinghouse type C motors. The pumps are of the ordinary Riedler pattern, with mechanically closed valves, and operate at 110 rev. per min. Compared with the previously mentioned pumping plants, this shows a marked advance in engineering methods; and the cost, which is about \$80,000 in



Pumping Engine, Mexican-Union Shaft.

ground bearings were rapidly consumed, and otherwise wasted. The wood burned cost \$10 per cord, and in the previous year cost \$12. From January 1882 up to January 1884, the C. & C. Shaft Co. paid \$6000 per month for water-power to operate their hydraulic pumps, and \$10,000 after that date. This water was furnished under a static head of 2016.5 ft. to the Sutro Tunnel level. As an average of six months pumping in 1884, from the 2400 and 2600-ft. levels with the hydraulic pump, the cost of water raised per horse-power was \$20 per month, a little more than the cost of wood with the Cornish system. But in 1886, when the 3000-ft. level pump was running, the price fell to \$11.50 per pump horse-power.

In comparison with the above enormous pumping equipment, high costs and operating expense, a brief description of the present electrical pumping equipment at the C. & C. shaft may be interesting. Hydraulic elevators were installed in the C. & C. shaft, and with them, in connection with the electric pumps, the water has been lowered 750 ft. Under existing conditions, I believe this device is the most practical sinking pump in existence. It is true that the effi-



Pumping Engine, Forman Shaft.

running order, is but a fraction of what was formerly paid, while the running expense is about \$4000 per month.

YUKON TERRITORY WEST OF LEWIS RIVER.

By D. D. CAIRNES.

*The season of 1908 was chiefly devoted to the mapping and geological examination of those areas north of Whitehorse and south of Tantalus known to contain coal or to be underlain by coal-bearing formations, it being more particularly desired to ascertain the nearest points accessible to Whitehorse at which coking coal similar to that at Tantalus could be obtained. The entire district strictly belongs to the interior plateau region of the Yukon Territory, which, originally eroded to peneplain conditions, was subsequently subjected to a rather rapid uplift.

There are two coal-bearing horizons of economic interest in this portion of the Yukon Territory. An upper horizon occurs near the top of the thick assem-

*Abstracted from Summary Report, Geological Survey Branch, Department of Mines, Canada, 1908.

blage of conglomerate beds forming the upper half of the group of Cretaceous sediments, and to this higher zone belong the seams at the Tantalus mine and on Tantalus bluff. A second, lower coal-bearing horizon lies toward the base of the Cretaceous column as seen at the Five Fingers mine, also at a point west of the 69-mile post from Whitehorse on the Whitehorse-Dawson road, and elsewhere. The seams of the Tantalus bluff and the Tantalus mine doubtless extend a number of miles to the north and south of these places, but prospecting for coal is rendered particularly difficult there by the thick mantle of glacial and recent alluvial material which covers the greater part of the district. Beginning within a distance of two or three miles south of Tantalus, the Cretaceous sedimentary rocks are, for the greater part, covered with more recent Tertiary basalts, basalt tuffs, etc., so that careful prospecting will be necessary to find it suitably located for mining purposes.

About four miles west of mile-post 69 from Whitehorse a number of seams have been uncovered, and probably others exist. Of the seams seen, one was 7 ft., another 4 ft., and several between 6 and 8 in. thick. Samples analyzed by F. G. Wait gave the following results:

| | I. | II. | III. |
|---------------------------|-------|-------|-------|
| Water | 8.98 | 12.02 | 4.68 |
| Volatile combustible | 29.62 | 34.28 | 15.59 |
| Fixed carbon | 48.30 | 42.56 | 72.26 |
| Ash | 13.10 | 11.14 | 7.47 |

Sample I represented the average of an 18-in. bed, II of a 7½-ft. bed, and III of a 2-ft. bed, seen between mile-posts 113 and 114.

A few miles southwest of Montague are a number of claims, locally known as 'Macks copper'. The property is reached by a branch road leaving the Whitehorse-Dawson road, about six miles above Montague and following approximately the old Dalton trail southwesterly up the Hutchi river. From a point about eight miles in on this road a trail ascends the hills to the north of the claims, which virtually are on the summits, about four miles distant from and 1900 ft. above the valley. Practically all the ore in the vicinity appears to be on one claim. It appears in a fine-grained greenish porphyrite, at or near its contact with limestone, and consists chiefly of magnetite, with hematite in minor quantities, both being more or less impregnated with copper minerals, chiefly chalcopyrite, malachite, and azurite. The main mass of mineral is in the form of a small knoll of iron ore, about 200 ft. wide by perhaps 300 or 400 ft. long. On the south side of the hill the iron carries considerable copper, while the ore on the top shows none. The orebody in the more westerly locality is only 10 to 12 ft. wide, and lies next to and more or less in the limestone. The following samples were taken by the writer and have been assayed by Robert Smart, Government assayer at Whitehorse. No. I is an average from the end of a tunnel, No. II is an average of the best 4 ft. of the open-cut:

| | I. | II. |
|------------------------------|-------|-------|
| Gold, ounces per ton..... | Trace | 0.025 |
| Silver, ounces per ton | Trace | 3.400 |
| Copper, percentage | 1.80 | 5.55 |

On both sides of Gilltana lake, which lies some 15

miles in a northwesterly direction from Hutchi lake and village, are claims known both as the Gilltana Lake claims and as the Hutchi copper. The ore on the northwest side of the lake occurs at the contact between granite and limestone, and is in the form of narrow lenses of mineralized matter and quartz. The widest lens seen had a breadth of about 4 ft., but as a rule the bodies are only from 1 to 2 ft. wide and have at present no economic value. Across the lake the claims are chiefly located over the face of a hill rising about 1200 ft. above the water. The country rock consists mainly of mica schists, interbanded with which are some beds of quartzite and limestone, the latter generally being narrow—3 to 4 ft. wide, but sometimes as much as 50 ft. thick. The strata strike about parallel with the lake and dip into the hill, so that the different bands of schist extend along the face of the hill, one above the other, maintaining an almost horizontal outcrop. In places these bands have become mineralized with magnetite, generally carrying copper minerals, chiefly chalcopyrite and malachite, and these constitute the orebodies. The original schists show all degrees of mineralization and replacement, from portions entirely non-metalliferous to others now consisting of almost solid iron ore.

The best of these mineralized bands or zones average from 6 to 10 ft. in width, although one was seen having a breadth of 20 ft. and consisting of almost solid ore. The mineralized bands generally can be traced for 50 to 100, or even 200 ft., when the iron and copper minerals gradually disappear, or at times seem to be continued along other parallel bands. Three prominent, with other less important bands, were observed at different elevations on the face of the hill. At the surface the copper minerals appear to have been leached out. On the Helen claim, up Franklin creek, some open-cut work has been done, and there in places streaks of copper ore 1 to 3 ft. thick were seen, included in wider bands that are much richer than observed elsewhere.

Apparently the ores are connected in origin with the intrusive granites found in the vicinity. The strata have been cut by dikes of light colored hornblende andesites and dark fine-grained basalts, but these have had no visible effects on the ore deposits. The district is well worth prospecting and a number of the claims look very promising. The following represent the results of assays of two samples from this district. No. I is a sample taken across the strike of one of the best looking bands, which had a width of about 6 ft. No. II is a sample of one of the 3-ft. streaks of copper ore on the Helen claim.

| | I. | II. |
|------------------------------|-------|-------|
| Gold, ounces per ton | Trace | Trace |
| Silver, ounces per ton | Trace | Trace |
| Copper, percentage | 1.35 | 9.00 |

Since the season of 1905 the Venus, on Windy Arm, has been worked continuously, with very satisfactory results, so that now a large amount of ore has been blocked out and some small high-grade shipments have been made to outside points. During the past year this is the only property in the district upon which important work has been performed.

STATE GEOLOGICAL SURVEYS.

Officers of the various geological surveys are now planning for a busy season. Below we give outlines of the work to be undertaken in several States.

Alabama. Work in this State is at present largely concentrated on studies of the Coastal Plain. Plans for the season include conference trips of E. A. Smith, State Geologist, with E. H. Sellards, of Florida, and T. W. Vaughan, of the U. S. Geological Survey, along various rivers, continuing the work of last season. During the summer the offices of the Survey will be moved into Smith Hall, the beautiful museum building designed to shelter the geological collections, and now nearing completion.

Arkansas. A. H. Purdue, State Geologist, will spend most of the season working on the geology of the Ouachita mountains. A party under W. N. Gladson will measure the available water-power of White river and its tributaries. A. A. Steel will study the coal mines with a view to developing methods of conserving the coal. H. D. Miser will take up the study of the clays. Samples will be collected and physical tests made at the U. S. Geological Survey testing plant at Pittsburg. This work will be supplementary to the report on Arkansas clays prepared by J. C. Branner and recently issued.*

Colorado. The Colorado legislature was generous this year; so generous that about a million and a quarter was appropriated above the revenues of the State. The Governor, in vetoing individual items, cut out the \$10,000 appropriated for co-operative topographic surveys, and part of the sum set aside for the regular geological work. As a net result, R. D. George, State Geologist, has only \$10,000 available for this season. The plans include the survey of the Monarch-Garfield district of Chaffee county, a study of the placer deposits near La Veta pass in Costilla county, and a continuation of the investigation of the clays of the State. About the middle of the summer a party sent either into the San Juan southeast of Silverton, or near Granite, south of Leadville. The physical and chemical testing of the building stones will be continued, and a bibliography of the geology of the State is expected to be ready for the printer before Christmas.

Florida. E. H. Sellards, State Geologist, expects to publish this season a progress report on fullers earth. A report on the general geology and stratigraphy of the State prepared by the U. S. Geological Survey in co-operation with the Florida Survey also awaits publication. It is expected that a preliminary report on the peat deposits of Florida will be published during the present year. Investigations preparatory to a report on the phosphate deposits are in progress.

Georgia. S. W. McCallie, State Geologist, with his assistants, will devote the present field season principally to a study of the limestone and cement materials of the State. The asbestos deposits will also be investigated.

Illinois. Preliminary plans only are as yet available, since the General Assembly has but recently ad-

journed. The work will be under the charge of Frank W. DeWolf, Acting Director, and will include topographical and geological surveys throughout the State. In the lead and zinc area near Galena large scale detailed maps will be made by G. H. Cox. E. W. Shaw, of the U. S. Geological Survey, has been detailed to take up the co-operative studies of the coalfields. E. F. Lines will continue his work on the clays. David White and E. F. Burchard will study the stratigraphy of the coal measures and the character of the available road materials, respectively. R. S. Blatchley will survey the oilfields, and J. A. Udden, Stuart Weller, Jon Udden, and other members of the corps will continue their work of last year. A slight increase of funds is available.

Indiana. W. S. Blatchley, State Geologist, will devote personal attention to the oilfield near Oakland City. This promises to become one of some importance. C. W. Shannon and A. E. Taylor will continue soil surveys in the southern part of the State. W. M. Tucker is measuring the water powers. A revised edition of G. H. Ashley's report on the coalfields, based on re-surveys made by himself and E. F. Lines last season, is in press.

Maryland. W. B. Clark, State Geologist, reports that this season the Maryland Geological Survey will complete special reports on the lime and cement industries and on the iron ores. The work on the Devonian will also be finished, while that on the Lower Cretaceous will be continued. Areal surveys in Anne Arundel and Talbot counties will be undertaken, and in co-operation with the U. S. Geological Survey a special survey will be made of the water resources. The Highway Division of the Survey has under construction \$350,000 worth of roads, and applications have been filed for roads to the amount of \$250,000 additional.

Michigan. A. C. Lane, State Geologist, has resigned to accept a position in Tufts College. His successor has not yet been announced. Mr. Lane will remain temporarily at Houghton, continuing his studies of the grain of rocks and of mine waters.

Mississippi. A. F. Crider has resigned to accept a position with a marble company in Alabama. E. N. Lowe has been appointed State Geologist to succeed him.

Missouri. The appropriation for the next biennial period has been fixed at \$35,000, a substantial increase. H. A. Buehler, State Geologist, expects, in co-operation with the U. S. Geological Survey, to take up a systematic re-study of the coalfields, and also to make surveys of the Aurora, Wentworth, Stotts City, and Sarcoux areas, in the southwestern lead and zinc region. Mapping will be carried on near Ste. Genevieve and Rolla, and a special re-study of the iron ores of the State is planned.

New Jersey. H. B. Kummel, State Geologist, reports that the principal new work for the year will be the inauguration of soil surveys in co-operation with the State Agricultural Experiment Station and the Bureau of Soils at Washington. In connection with the Road Department all the asphaltum binder used on the State macadam roads will be tested. Folios discussing the geology of various important areas will be issued.

*Bull. 351, U. S. Geol. Survey.

New York. John M. Clarke, State Geologist, has under way a variety of interesting researches. The depleted condition of the Saratoga mineral waters, the heated litigation over them during the past few years, recent drastic legislation designed to suppress the production of natural carbon dioxide derived from them, and the new statute which has bonded the State for the purpose of taking over as a public preserve as much of the mineral spring property as seems wise in the judgment of the newly appointed commission, have made it imperative to acquire more accurate information in regard to the tectonic conditions in Saratoga county and the relations between them, the salines, and the carbon dioxide pressure. Special attention will be given this year to the problems presented by these springs. The study of the crystalline rocks is in charge of H. P. Cushing and W. J. Miller, the Paleozoics will be studied by R. Ruedemann, the special tectonic and economic problems by D. H. Newland, and the crystallographic analysis of the mineral waters will be in charge of H. P. Whitlock. In the eastern Adirondacks J. F. Kemp will continue his work on the crystalline geology of the quadrangles in Essex and Clinton counties, and in southeastern New York Charles P. Berkey will carry on the study of the complicated crystalline rocks from the Highlands southward to Manhattan, in co-operation with the New York City Board of Water Supply. This work will be supplemented by the survey of Westchester county to be made by C. E. Gordon. In western New York additional areal work in the higher Paleozoics will be continued by D. D. Luther. The gypsum industry, which has reached very large proportions in this State, will be investigated by Henry Leighton.

North Dakota. The small appropriation available in this State limits the work severely. A. G. Leonard, State Geologist, will, however, in co-operation with the U. S. Geological Survey, study the geology of the Bismarck quadrangle while an assistant is at work in the central part of the State on the coal-beds and underground waters. The Fifth Biennial Report is now in press. It includes reports on the coal deposits of the southwestern, and cement materials of the northeastern, part of the State.

Oklahoma. C. N. Gould, Director, reports that during the present summer it is planned to have several parties in the field. D. W. Ohern, in the north-central part of the State will investigate the occurrence of oil and gas, portland cement rock, and shales. He will be assisted by Frank A. Herald, Key Wolf, Warren Hazeltine, and A. C. Reeds. L. L. Hutchison, Assistant Director, will study the asphalt deposits in the southern part of the State. He will be assisted by B. C. Belt. Mr. Hutchison's preliminary report on the oil and gas deposits is about completed and, with the asphalt report, will be published some time during the summer. Mr. Gould is himself at work on a report on the building material of Oklahoma and hopes within a year to have published reports on the clays and shales. L. C. Snider, recently appointed chemist, will spend the summer in the U. S. Geological Survey testing plant at Pittsburg, making tests of several hundred samples of Oklahoma clays.

Pennsylvania. There is no State Geologist of Pennsylvania at present, though the Geologic and Topographic Survey Commission, of which R. H. Hice is secretary, has in contemplation the organization of a State corps. So far the work has been done in co-operation with the U. S. Geological Survey. It is probable, in view of reduced appropriations, that little field work will be undertaken this year, attention being concentrated instead on publication of accumulated materials.

Washington. The Geological Survey which was discontinued in 1903 has been revived and Henry Landes has been re-appointed State Geologist. He will be assisted by S. Shedd, of Pullman.

CANADIAN GEOLOGICAL SURVEY.

The field assignments for 1909 are given in the *Canadian Mining Journal* as follows:

D. D. Cairnes will have a party in the Wheaton-Watson Rivers region, in southwestern Yukon. R. G. McConnell will complete his examination of the geology and mineral resources of Ténada island. F. H. McLaren will finish his topographic map of Ténada island. W. W. Leach is engaged in mapping in the vicinity of Hazelton, Skeena river, and will examine in detail the coal area near Telkwa, discovered by him last season. C. H. Clapp will continue his geological investigations on Vancouver island. R. H. Chapman will begin a topographical survey of Vancouver island. W. Sutton will report on the coal beds of the east coast of Vancouver island. Charles Camsell will continue work in the Similkameen district, more particularly in the Tulameen River district. L. Reinecke will complete the topographical map of the Tulameen and begin a survey of the west fork of the Kettle river. George Malloch will make a geological survey of the Fort George region on the Grand Trunk Pacific. O. E. LeRoy will study the geology and ore deposits of the Slocan. He is now completing a geological map of the Sheep Creek mining camp. W. H. Boyd will make a topographical map of the Slocan. S. J. Schofield will be employed in mapping in the East Kootenay district. John Macoun is continuing his natural history collecting in the West. D. B. Dowling will investigate the coal lands of Alberta west of Edmonton. W. McInnes will continue his geological investigations in the district north of Edmonton. W. H. Collins is continuing his examination of the Gowganda district. W. A. Johnston will resume his mapping of the Lake Simcoe region. M. E. Wilson will be working north of Lake Temiskaming. G. A. Young will continue his work in the Bathurst district, New Brunswick. J. A. Dresser will continue his investigations on the rocks and economic minerals of the Eastern Townships. R. W. Ells will complete his investigations of the oil shales of New Brunswick, and examine the shales of Nova Scotia and Gaspe. E. R. Faribault will continue mapping the gold-bearing rocks of Nova Scotia. H. Fletcher's field season will be spent studying the coal formations of Cumberland county. Heinrich Ries, accompanied by Joseph Keele, will begin a study of the clays of the Dominion. The Maritime Provinces will be examined this season.

GOLD AND SCHEELITE NEAR MACRAES, NEW ZEALAND.

Written for the MINING AND SCIENTIFIC PRESS
By PERCY MORGAN.

The association of scheelite, tungstate of lime, with auriferous quartz veins traversing schistose rocks may be observed in many localities in the South Island of New Zealand. One of these is in the old district of Marlborough, in the northeast of the South Island. The other localities are nearly all in the southern Province of Otago, the best known being Saddle Hill, near Dunedin, Macraes, Mt. Highlay, Bendigo, near Cromwell, and Glenorchy, at the head of Lake Wakatipu. At all these places the quartz veins have been more or less worked for gold or



scheelite or both. Up to the present time the most notable development of gold-scheelite veins has been near Macraes. A few observations made by the writer during a recent visit to this district may be of some interest. Macraes is a small settlement situated about 40 miles north of Dunedin, the principal town of Otago, from which it may be reached in a few hours by rail and coach. Near the township may be seen the abandoned workings on the Duke of Edinburgh reef. This lode is said to have yielded payable ore for some time, and with modern and economical methods of working could probably be profitably re-worked. Like the other veins of the district, it runs with the bedding planes of the mica-schists, which are here also the planes of schistosity. Since the schists in this part of Otago are as a rule very slightly folded, it follows that the quartz veins lie unusually flat. They seem to be confined to a certain horizon of the schists two or three hundred feet

in thickness, and so far as my observations go are confined to the anticlinal portions of the folds. They may therefore be regarded as extreme types of saddle reefs.

The principal mine of the district is the Golden Point mine, owned by Messrs. W. and G. Donaldson, and situated a few miles west of Macraes, in the valley of Deepdell creek, the lode now being operated on crops out on the eastern side of the valley, about 200 ft. above the mill. It averages $2\frac{1}{2}$ to 3 ft. in thickness, strikes N. N. W., and has for the most part a very gentle dip to the E. N. E. In places it is almost or quite flat. The lode matter is generally a mixture of small irregular veins and masses of quartz with mica-schist and material of nondescript type. Some parts of the lode consist of solid quartz, while others show little or no quartz. As a rule the walls, or in this case one might say the roof and the floor, are not very sharply defined. The ore generally contains from 5 dwt. to 1 oz. of gold per ton, while the scheelite ordinarily ranges from $1\frac{1}{2}$ to 2 or 3%. Near the outcrop the ore contains a good deal of iron oxide, but at a little distance from daylight pyrite and arsenopyrite begin to take its place. The gold is usually fine and is distributed through the quartz and other vein matter. It is alloyed with a little silver. The bulk, if not all, of the scheelite occurs in a quartz matrix, and has evidently been deposited contemporaneously with the latter mineral. The quartz often carries a high percentage of tungstate of lime, and sometimes the scheelite predominates to such an extent that the ore can be hand-picked. Such quartz, however, is often low in gold content.

Owing to the flatness of the lode, the ore is extracted from the mine by a somewhat irregular system of drifts and cross-cuts. Where the lode is thin or poor, pillars are left. Timber, an expensive item in a district naturally destitute of trees, is used where necessary. From the mine the ore is conveyed by an inclined tramway to the mill below. The ore-crushing appliances consist of a rock-breaker and 10 stamps, each weighing about 1000 lb. The stamps are given 100 drops of 7 in. per minute. The motive power is water, supplemented by steam. From the stamps the crushed ore passes over amalgamated copper plates, and is then conveyed to a V-shaped separating box. The fine material contained in the overflow from the box is concentrated on a Frue vanner, while the coarser material goes to a Woodbury concentrator. The concentrate, which contains about 30% of scheelite, is dried, bagged, and shipped to Germany. Experiments are being made to eliminate the iron and arsenical pyrite by roasting the concentrate, and then re-treating. A much higher grade of shipping material is thus expected to be obtained. I did not learn what amount of gold there is in the concentrate, but probably it is considerable. The tailing from the vanners is now being successfully treated in a small cyanide plant lately erected. Formerly, though some was saved in pits, it was for the most part run to waste. At Mt. Highlay, a few miles west of the Golden Point mine, a flat-lying bedded lode 10 or 12 ft. thick and of considerable horizontal extent was formerly worked on a small scale by

various owners. Messrs. W. and G. Donaldson now hold under Government lease practically all the old claims. Ore is being won chiefly from an open-cut near the top of a hill. The dip of the lode is here seen to increase gradually with depth, and in a low level drift the lode is vertical or even slightly overturned. This feature appears to be due to faulting. Much of the ore being mined is of low grade both in gold and silver, but it can be cheaply extracted and treated. It is conveyed by a self-acting inclined tram to the mill near the foot of the hill. The crushing plant here consists of a rock-breaker, 5 stamps (not set up at the time of my visit), and a 5-ft. Huntington mill. This latter machine does good work on the soft ore. It is run at 65 revolutions per minute, and crushes 30 to 35 tons of ore per 24 hours. The crushed material is run over copper plates, and then without sizing passed over a Wilfley concentrator. At the time of my visit the tailing was considered too poor to save, but a cyanide plant was being erected to treat the tailing from the richer ore, which it was proposed to mine and treat in the near future.

As regards the genesis of the ore in the quartz-scheelite veins of Macraes and other New Zealand localities, the chief point of interest is concerned with the origin of the scheelite. A. M. Finlayson* has suggested that the scheelite was formed by the combination of tungstic acid derived from granitic magma underlying the schists, with lime derived from the country enclosing the lodes. Though several objections may be urged against this theory, it is probably the best working hypothesis that can be advanced at the present time.

Low-grade porphyry copper deposits now developed in the United States represent 185,000,000 tons of ore, which will average about 1.7% net recoverable copper. Below is a list of all the low-grade milling properties, with capitalization, ore reserves, prospective output, and so forth:

| Company. | Number of shares. | Market value. | Present rate | |
|-----------------|-------------------|---------------|-----------------------|-------------|
| | | | Ore-tonnage estimate. | lb. copper. |
| Boston Con.... | 775,000 | \$ 12,000,000 | 37,000,000 | 20,000,000 |
| Utah Copper.. | 735,000 | 38,000,000 | 65,000,000 | 60,000,000 |
| Ohio Copper .. | 1,300,000 | 8,000,000 | 14,000,000 | (In prep.) |
| Nevada Con. . | 1,600,000 | 36,000,000 | 30,000,000 | 30,000,000 |
| Cumb.-Ely ... | 1,300,000 | 10,500,000 | 4,000,000 | 18,000,000 |
| Giroux | 1,300,000 | 10,500,000 | ..... | ..... |
| Miami | 600,000 | 9,000,000 | 13,000,000 | (In prep.) |
| Inspiration ... | 1,000,000 | 8,000,000 | ..... | (In prep.) |
| Ray Central .. | 800,000 | 2,800,000 | 6,000,000 | ..... |
| Ray Con. | 800,000 | 12,000,000 | 16,000,000 | (In prep.) |
| Total, | 10,210,000 | \$146,800,000 | 185,000,000 | 128,000,000 |

Stokers of furnaces must be set so that combustion will be complete before the gases strike the heating surface of the boiler. When partly burned gases at a temperature of, say, 2500° F., strike the tubes of a boiler at, say, 350° F., combustion is necessarily hindered and may be entirely arrested. The length of time required for the gases to pass from the coal to the heating-surface probably averages considerably less than one second, a fact which shows that the gases and air must be intimately mixed when large volumes of gas are distilled, as at times of hand-firing, or the gas must be distilled uniformly, as in a mechanical stoker.

*Transactions of the N. Z. Institute, Vol. XLII, 1908.

ACCOUNT NUMBERS.

Written for the MINING AND SCIENTIFIC PRESS.
By H. E. WEST.

No argument is necessary for the importance of accurate and itemized costs in all departments of mining. They are as necessary to small as to large undertakings. 'Loose-leaf forms filed in standard 'binders' permit such figures to be easily kept. Daily labor-tickets and labor-sheets are available, which are returned from the several departments and entered by the cost-clerk on the day-line of the monthly labor statement, and being finally totaled, show the cost of labor segregated for each department. Accurate costs are impossible unless such labor statements—and the same applies to store tickets—are used. If a written description of the work chargeable is attempted, much depends on the accuracy of description, and considerable confusion results. This the luckless cost-clerk must unravel as best he may. What are wanted are concise exact specifications of charges for both labor and material. Such a requirement is admirably filled by the use of numbers.

The method of using account numbers is already employed in all branches of business, factories, and mines, and has proved its utility. It is well adapted to smaller undertakings, where usually, for want of definite systems, the greatest inaccuracy regarding costs exists. The scheme is illustrated below from the accounts of a working mine:

WORK NUMBERS.

| | | |
|------------------------|-------------------------|-----|
| MINE DEPARTMENT. | SMITHS' SHOP | 302 |
| BREAKING ORE | Supplies | 303 |
| Explosives | ELECTRIC LIGHTING .. | 304 |
| Timbering | Repairs, renewals... | 305 |
| Tramming | Supplies | 306 |
| Air line and drills.. | TELEPHONES | 307 |
| Lighting | Supplies | 308 |
| Supplies | MACHINE SHOP | 309 |
| MINE IMPROVEMENT .. | Repairs, renewals .. | 310 |
| Explosives | Supplies | 311 |
| Timbering | LIME PLANT | 312 |
| Tramming | MINE STORE | 313 |
| Air line and drills.. | TRACTION ENGINE ... | 314 |
| Lighting | Supplies | 315 |
| Supplies | PUMPING | 316 |
| Repairs, renewals... | Repairs, renewals... | 317 |
| Supplies | Supplies | 318 |
| HOISTING | Supplies | 319 |
| Repairs, renewals... | POWER PLANT | 320 |
| Ropes and cages... | Boiler room | 321 |
| Head-frame | Compressor | 322 |
| Supplies | Shop engines | 323 |
| BLACKSMITH SHOP... | Electric light plant... | 324 |
| Supplies | Feed-water system... | 325 |
| MACHINE-DRILL PARTS. | Fire-pump | 326 |
| DIAMOND-DRILL | Supplies | 327 |
| Supplies | GENERAL EXPENSES. | |
| ASSAY OFFICE | DIRECTORS' QUARTERS. | 400 |
| Supplies | Repairs, renewals .. | 401 |
| SURVEY DEPARTMENT .. | Supplies | 402 |
| Supplies | GENERAL OFFICES ... | 403 |
| CRUSHING DEPARTMENT. | Repairs, renewals .. | 404 |
| CRUSHER | Furniture, fixtures... | 405 |
| Repairs, renewals... | Supplies | 406 |
| Supplies | MEDICAL DEPARTMENT. | 407 |
| TRANSPORTATION OF ORE. | FIRE PROTECTION | 408 |
| Repairs, renewals... | MAINTENANCE OF | |
| Supplies | BUILDINGS | 409 |
| ORE SORTING | Supplies | 410 |
| Supplies | FURNITURE, FIXTURES... | 411 |
| MECHANICAL DEPARTM'T. | SURFACE IMPROVEMENT. | 412 |
| FRAMING AND CARPEN- | STABLES | 413 |
| TER SHOP | Supplies | 414 |
| Supplies | GENERAL STORES | 415 |
| | Supplies | 416 |
| | LIGHTING, HEATING... | 417 |

Each department is given a series of numbers, as follows: The Mining Department takes numbers starting from 100; the Milling Department, numbers starting from 200; the Mechanical Department, from 300; the General Costs, from 400. Construction numbers start at 500. Doubtless alterations and improvements will readily suggest themselves for particular cases. The feature recommended, however, is the use of numbers for the charging of all labor and material. No description is permitted of any work done. It must fit into one of the several numbers. If the timekeeper or operator cannot be exact, how much less can the cost-clerk? Should an order come to the store without a number, it is returned for amendment. The same rule applies to all requisitions on the factory or other manufacturing departments. Some uncertainty may exist at first, but the employees will soon find that the actual number of figures employed is small. Copies of the scheme should be posted in conspicuous places, and such copies should be amended from time to time, especially with regard to construction numbers. When a construction account is closed it should be cancelled. On any new construction work being undertaken, the first thing to do is to have the number posted. Small orders passing through the shops, for outside work, etc., can be issued through 'Job Orders'; a card bearing a number, starting from 1000 for distinction, is issued, and when the work is completed the card is returned to the office, signed by the foreman, and with labor and material indicated. This affords concise specific information. The numbers are subject to abuse, it is true, but the mistake is usually self-evident and can be amended. In foreign countries where there are difficulties of language, especially in writing, the numbers will afford a ready means for the suitable description of any particular work.

HYDRAULIC DREDGING FOR GOLD.

By HENRY G. GRANGER.

*Repeated failures in attempts to work gold-bearing gravels by means of suction-dredges have created the impression that this method is impracticable. The suction-dredges have failed from three special causes: excessive wear and frequent breakage of pump-shell, runners, and liners; inability to dredge compact gravel which would not readily move toward the intake; and, most important of all, closing of the suction-pipe by stones too large to enter it. In my opinion, all three causes of trouble may be remedied: the first, by making stronger the parts most liable to wear and breakage; the second, by means for loosening the gravel at the intake; and the third, by sufficiently increasing the diameter of the suction-pipe. In suction gold-dredges, this diameter has not usually exceeded 10 or 12 in.; whereas there are few profitable goldfields which can be considered dredgeable, in which stones more than 12 in. diam. are not frequently encountered. In harbor-operations, much larger stones are handled by suction-dredges. The large dredge of the Henry Steers Contracting Co. worked for nearly four years at

League Island, Philadelphia, where it sucked up, passed through the pump, and forced through 3700 ft. of discharge-pipe, gravel containing boulders up to 200 lb. in weight. This was done with no bad breaks and few shut-downs. The cutter and liners were the only parts liable to damage, and these were easily replaced with brief interruption of work. The chrome-steel liners are said to have lasted six to nine months. I am informed that this dredge worked continuously for nine months at Harrison, New Jersey, on gravel, much of which carried stones as large as a man's head.

The essential features of this dredge are as follows:

The centrifugal pump, made by the Morris Machine Co., of Baldwinsville, New York, was designed for a 22-in. suction, discharges at the bottom, and is driven at 225 rev. per min. Its shell is approximately 84 in. diam., with a runner about 60 in. diam. The runner-bearing has a water-sleeve to keep the sand out, supplied by a small force-pump worked at 60-lb. pressure. The pump is set 30 ft. from the bow. Power is supplied by a compound marine engine, with surface-condenser, 22 by 42 by 26-in stroke, running 90 rev. per min. On the engine shaft is a 65-in. gear with wooden cogs, driving a 26-in. steel pinion. The wooden cogs are said to run about six months before renewal. On the pump-shaft keyed into the pinion is a slipping spring coupling. When a stone or log, too large to go through, gets into the shell, the runner is brought to a full stop without damage. This occasionally happens, and the obstacle may be removed by taking off the plate, with a loss of time averaging not more than 15 minutes. The pump uses from 450 to 500 hp., which is considerably in excess of the economical requirement of a pump of this size, but with it the material may be forced through a pipe-line 4000 ft. long. I am told that, with 1000 ft. of discharge-pipe, 1000 cu. yd. of gravel per hour may easily be handled. The total power used on the dredge is 800 horse-power.

The winch, with its various barrels for working-lines, suction and cutter-hoisting lines, and spud-hoisting lines, is a Lidgerwood machine, with two cylinders 14 by 18 in. The winch-engine also drives a chrome-steel gear, which through a shaft drives a 7-ft. chrome-steel cutter. The cutter-shaft is connected with and driven by a universal joint. The wrought-iron suction-pipe, the mouth of which is just above the lower rim, of the cutter, is connected by a flexible rubber joint to the cast-iron pipe which extends to the pump. The two timbers used as braces for the shaft and pipe are so hinged that their movement can only be vertical. The wrought-iron suction-pipe lasts for a year; the cast-iron pipe, including the elbow running from the rubber joint to the pump, lasts four years.

This is said to be the largest suction-dredge in the world that has continuously handled coarse gravel, and in capacity is the largest gravel-dredge of any class. The outboard suction is 54 ft. long, and the dredge can work to a depth of 30 ft. I am told that it has frequently sucked up from the bottom heavy spikes and tools which had been dropped into the water several feet in advance of the pipe.

*Abstracted from Trans. A. I. M. E.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINING LEASE—ACCEPTANCE.

A coal lease executed by the life tenant and part of the remainder-men only, and not signed by the lessee, was not accepted and adopted by the parties so as to make it binding where the lessee corporation, by its agents, simply went on the premises to investigate and discovered coal in workable quantities, the lessee never having advised the lessors to that effect nor decided what to do, where it had the option to determine whether it would mine the coal. Neither the life tenant nor remainder-men could have enforced the lease, nor could the lessee have done so without signing and electing to proceed to mine coal thereunder.

Greenridge Fuel Co. v. Littlejohn, (Iowa) 119 North-west. 698, Feb. '09.

ACTION AGAINST MINE OWNER FOR INJURIES—PLEADING.

In an action against a mine-owner for injuries to real property, due to mining operations below the surface, the complaint must state facts showing whether the mine-owner was a trespasser, or whether he acted under any right in making the excavation, and it must also allege the time when the injury occurred, as under the statute, the action must be brought within one year from the time of the injuries.

Sloss-Sheffield Steel & Iron Co. v. Sampson, (Ala.) 48 South. 493, Jan. '09.

LEASE TO MINE—LIABILITY OF LESSEE FOR ROYALTY.

The lease of a coal mine stipulated that the lessee should mine not less than 8000 tons per year, and he was to pay a royalty on that amount, whether mined or not, at 5c. per ton, unless he was unavoidably prevented from taking out the coal, but he was to be liable for the royalty. In an action for the royalty it was decided that the lessee was not liable where the mine could not be operated; and evidence was proper as to whether the mine could be operated at a profit, and the lessee was justified in abandoning the mine.

Wilson v. Big Joe Bluff Coal Co., (Iowa) 119 North-west. 604, Feb. '09.

MINING—COMPETENCY OF EXPERT.

Men of experience in mine-working who are capable of determining the quality of coal taken from a particular mine, who can state whether coal was properly mined, and the cost approximately of mining it, and who knew the market price of coal, were competent to express an opinion as to whether the particular mine could be operated at a profit.

Wilson v. Big Joe Bluff Coal Co., (Iowa) 119 North-west. 604, Feb. '09.

CONSTRUCTION OF OIL LEASE.

An oil lease which granted to the lessee the exclusive right to mine for and produce oil and natural gas from a certain tract of land, and which granted the possession of so much of such land as might be necessary therefor, did not give the lessee the right to use any portion of the land for cultivation, or for residences and conveniences for employees, but confined the occupancy and use of the surface to so much of such land as was strictly necessary for mining and producing purposes.

Fowler v. Delaplain, (Ohio) 87 Northeast. 260, Jan. '09.

MASTER AND SERVANT—DUTY TO LIGHT MINES.

A coal miner approaching the bottom of the shaft from above, with a view of leaving the cage, or approaching the bottom of the shaft from his working place below, with a view of entering the cage, is within the protection of the Illinois statute which provides that so long as there are miners underground, the operator shall maintain sufficient light at the bottom of the shaft so that persons coming to the bottom may discern the cage and objects in the vicinity.

Robertson v. Donk Brothers Coal & Coke Co., (Ill.) 87 Northeast. 373, Feb. '09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

BIENNIAL REPORT OF THE STATE GEOLOGIST (Missouri). By H. A. Buehler. pp. 59. Jefferson City, 1909.

VALUATION OF UNCONFORMITIES. By Eliot Blackwelder. Jour. Geol., Vol. 17, pp. 289-299. Chicago, 1909.

SMOKELESS COMBUSTION OF COAL IN BOILER PLANTS. By D. T. Randall and H. W. Weeks. U. S. Geol. Survey. pp. 186. Washington, 1909.

PRODUCTION OF PHOSPHATE ROCK IN 1908. By F. B. Van Horn. U. S. Geol. Survey. Mineral Resources of the United States for 1908. pp. 16. Washington, 1909.

Commercial Paragraphs.

The JOHN A. ROEBLING'S SONS Co. is soon to issue a booklet illustrating the proper way to attach sockets to wire rope. It will be ready about August 1.

The UNION IRON WORKS, San Francisco, last week sold to the Tonopah Extension Mining Co., of Tonopah, Nevada, a 30-stamp 'Union' battery complete.

THE FOOS GAS ENGINE Co., Springfield, Ohio, reports that its business during May 1909 was considerably larger than for the same month of any previous year. The month of April showed the largest business ever done in a single month, and the first five months of the present year show a greater business than has ever been done in the same period. As an indication of returning prosperity these facts are gratifying, and of prospects for the future it is welcome to note that the Foos Gas Engine Co. is increasing its facilities and that the plant is running at its fullest capacity 19 hours per day.

The DENVER QUARTZ MILL & CRUSHER Co., Denver, Colorado, is placing on the market a quartz-mill for which it claims great efficiency and capacity. The machine is of the Chilean mill type, the grinding being done by rolls or mullers, traveling in circular mortar or ring die. The largest mill is 5 ft. 6 in. diam., with six rolls 23 in. diam. by 8 in. wide, each weighing 800 lb., revolving around a circle 15 ft. 6 in. diam., at a rate of 30 rev. per min. The discharge is through a screen completely enclosing the grinding mechanism of the mill. The feed is arranged to take the ore direct from the crusher. The drive is so arranged that no oil can get into the ore and hinder subsequent treatment. One particular advantage of the mill would appear to be the accessibility of its wearing parts and the ease with which renewals or necessary repairs may be made.

Catalogues Received.

The HENDRIE & BOLTHOFF MFG. & SUPPLY Co., of Denver, Colo., is distributing a pamphlet called 'Power Irrigation'. While primarily designed for those interested in irrigation, it is of general value because of the unusual amount of data about small pumping plants that it contains. "Don't forget that pumping with power is an engineering subject requiring broad knowledge of hydraulics, electricity, and power engineering in general. Don't forget that metal is required to make good machinery, and that weight cannot be cut below a certain amount without detriment. Don't forget that speed means power, and that you can get more power from a motor or engine operating at a high speed than from one of the same size and weight running at low speed." These are all bits of advice as valuable to miners as to farmers. The rules given for rough estimates of power required for various situations, and estimates of cost, will be valuable to all proposing to install small plants, while the directions for priming and running centrifugal pumps, if faithfully followed, will save much delay and trouble. The numerous tables and illustrations add to the value of the book.

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SAN FRANCISCO, JULY 10, 1909.

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TABLE OF CONTENTS.

| EDITORIAL: | Page. |
|--|-------|
| Notes | 37 |
| Coal and Iron in Japan..... | 38 |
| Civil Service Reform | 39 |
| GENERAL MINING NEWS | 41 |
| SPECIAL CORRESPONDENCE | 46 |
| CONCENTRATES | 51 |
| DISCUSSION: | |
| Protection of Investors.....Geo. A. Packard | 52 |
| Legislation Regarding Oil Lands.....Wm. Forstner | 52 |
| The First Rock-Drill.....S. H. Brockunier | 53 |
| Vein-Continuity on Mining Claims.....H. W. M. | 54 |
| Cornish Pumps | 54 |
| ARTICLES: | |
| Historical Geology of California..William Forstner | 55 |
| New Zealand Placer Mines..... | 58 |
| Proposed Law Governing Oil Lands..... | 60 |
| Andean Placers | 61 |
| Compound Cornish Pumping Engines..... | 62 |
| Vacuum Slime-Filters at Goldfield..... | 65 |
| Pelly, Ross, and Gravel Rivers.....J. Keele | 66 |
| Alaska Surveys Now Under Way..... | 67 |
| THE PROSPECTOR | 61 |
| DECISIONS RELATING TO MINING..... | 68 |
| DEPARTMENTS: | |
| Personal | 40 |
| Market Reports | 40 |
| Publications Received | 68 |
| Catalogues Received | 68 |

EDITORIAL.

AN average of 72.5 pounds of copper per ton was the amount recovered from the ores mined at Butte during the month of June.

WEDDINGS are joyful occasions, and much to be encouraged. At least the Central India Railway Company believes so, since decrease in Hindu marriage celebrations has seriously cut revenues from passenger traffic. The silver miners are yet to be heard from.

CONSTRUCTION of the Cape to Cairo railroad goes steadily forward, and, as is usual with pioneer railroad enterprises, the building is from mine to mine. Contracts have recently been let to connect the Star of the Kongo mine, in the Kongo Free State, with Broken Hill, in Rhodesia.

PIG IRON production shows a significant and gratifying increase, according to figures furnished by the Bureau of Statistics. In May the amount produced, 1,880,098 tons, was nearly 60 per cent ahead of production for the same month of 1908. For the first five months of this year the output has shown an almost equal increase.

UTILIZATION of the continuous revolving filter for slimes is reported from South Africa, being applied in the Rand mills by Mr. W. A. Caldecott. This system, employing a permanent sand filter-bed, and a scraper to remove the slime after the vacuum has exhausted the cyanide solution, was introduced into American practice by Mr. Bertram Hunt only a year ago. It is pleasing to note this recognition of a meritorious innovation in cyanide work.

RUMORS of consolidations of copper properties are heard on all sides. The advantages of a union of the Utah Copper and Boston Consolidated are being debated at Salt Lake, while the British Columbia Copper and the Dominion Copper companies are also coquetting. Since the Lewisohn interests secured control of the British Columbia there is already some community of interest between these two Canadian companies. Both consolidations have much to commend them, and seem likely to be brought about now or later.

RHODESIA has a system of inspection which provides quite effectually for the enforcement of regulations regarding assessment work. In the United States we take the oath of an interested party. As a result, it is exceptional in many camps for a bona fide \$100 worth of work, as provided by law, to be annually done on each claim. In places the matter is a farce, and we are told of one Nevada camp in which no genuine assessment work has been done for five

years. The net result is to tie up considerable areas, withdrawing them from real prospecting, and to defeat the very object of the law. We fear that the poor prospectors as well as the wicked corporations are in some need of a moral uplift.

WISCONSIN evidently appreciates the work being done by its Geological and Natural History Survey, since to the regular annual appropriations of \$10,000 each for road studies, and for geological work a third \$10,000 has been added for soil surveys. Plans for the season are now being made. In Washington the Geological Survey has been re-established, with appropriations for the biennial period of \$25,000 for geology, \$10,000 for hydrographic studies, and \$20,000 for topographic surveys. Other States have made the usual appropriations, and this will be a busy season for the geologists.

ILLINOIS is to have a School of Mines connected with its University. It was asked for by a committee representing the miners, operators, inspectors, and manufacturers, and the General Assembly promptly voted the money. It is understood that the men will be especially trained to work in and investigate the problems of coal mining. This is quite as it should be. While we have many mining schools in the United States, but little attention has been paid to the peculiar features of coal mining. It is appropriate that Illinois should lead in this, and it is well that the schools should differentiate rather than duplicate.

ANNOUNCEMENT of acceptance by the Paris Bourse of United States Steel common proves to have been premature. Mr. J. Pierpont Morgan evidently enjoys greater favor at the Vatican than among the guardians of French conservatism in finance. Extensive dealing in American securities has been practised of late by Frenchmen, placing orders through Paris banking houses which have connections in New York. The managers of the Bourse fear a sudden and uncontrollable fever of speculation if the seal of approval were set officially upon even so sound a stock as Steel common. The delay, however, only encourages reckless plunging by those who think they have discovered a road to easy fortune in American stocks. The regulated stock exchange is better than the bucket-shop, and the pressure of idle money offers opportunity for the shearer of the lambs. Mr. Morgan will win his point, and the result will benefit both France and the United States.

TO BE 'born in Missouri is to be born to trouble', according to an old saw, and it seems to apply to institutions such as the Geological Survey of the State, as well as to individuals. Nowhere else has there been such a succession of storms centering around the office of State Geologist. Yet there have been capable men in the position and work of a high character has been done. The variety and importance of the mineral deposits, the fundamental character of the geological problems to be investigated, and the large areas as yet but little studied, make the maintenance of a survey of more than local

import. In general the State has been willing to have the work go forward, and the appropriations have, on the whole, been comparable to those of its neighbors. While the successive Governors and political powers that be have not been well informed as to the nature and duties of geological surveys, they have, with the notable exception of ex-Governor Stevens, been willing to be advised by those at least presumed to be informed. The whole trouble has seemed to lie in the failure to follow any systematic plan and to secure continuity in the work or permanence of service for the men. Even poorer geologists or engineers than those who have served as Director could have accomplished more if supported in a persistent campaign. The present incumbent of the office, Mr. H. A. Buehler, is an honest and able officer. The present Governor, Mr. Herbert Hadley, is an aggressive exponent of the doctrine of efficient State service. It should be a good time to put the work on the right basis, and to establish the precedent of continuity. There has recently been considerable local, but unfounded, criticism of the Survey. The Legislature properly disregarded it in making appropriations. We hope the organization may now have what it most needs—a period uninterrupted by fault-finding, in which to do some much-needed work.

Coal and Iron in Japan.

Possible Japanese competition in the iron and steel industries, while unlikely for some years, should not be altogether neglected. The iron makers of Japan are in somewhat the same position as are the owners of American seaboard blast-furnaces. They have fuel, markets, and labor, but must in the main import their ore. Little is known as to the iron ore reserves of Japan. Deposits exist near Sakai, Miyako, Minato, and west of Tokyo, but none of these have been much developed. At present the 40,000 tons of pig iron made annually is derived from Chinese ore, which is brought from 200 miles above Hankow. The expense is considerable, and Japanese pig iron in 1907 cost approximately \$20 per ton. That year Japan imported twenty million dollars worth of iron and steel products, and with her best efforts it will necessarily be a long time before local furnaces and steel mills can supply the domestic trade. Eventually it seems quite as likely that the Chinese will work up the iron ores found on the mainland as that the Japanese will do it for them, and indeed at present a certain amount of Chinese pig iron is imported by the Pacific Coast States, and an important Chinese steel-making industry is being established.

In coal mining Japan is advancing more rapidly. As is well known, there are extensive coal fields, both on Hokkaido in the north and Kyushin in the south. It is estimated that the coal reserves amount to 1,200,000,000 tons, and mining is going forward at the rate of approximately 14,000,000 tons per year. The coal beds are well situated for mining, and are 3 to 25 feet thick. Despite these facts, the output per miner is small, approximately 240 tons annually, and the costs are high. The plants are not large, measured by American standards, the most important yielding but a little over a thousand tons per day. Machinery is being introduced for undercutting the

coal, and it is hoped that the cost of production will be reduced. The quality of the coal is not high, though satisfactory for most purposes. The mines already supply a wide trade, which may be reasonably expected to expand.

Civil Service Reform.

The merit system of selecting men and women for the Federal civil service is too well established to be overthrown. Of the 352,000 positions, 206,600 are now filled by appointments based on competitive examinations. The number of places filled by this method is constantly increasing, and the number open to appointment without examination is as constantly decreasing. Any attempt to re-establish the old spoils system may be safely considered to be outside the domain of practical politics. Indeed, the experienced politicians are, generally, friendly to the system. Congressmen soon find that dispensing small patronage produces big quarrels, and while to their followers some may feel obliged to protest against the cruel system which prevents their passing out unlimited clerkships, practically they are many times glad of its protection. The establishment of the present system was a vast improvement on what obtained before; it does not follow that no further improvement is possible. For some years it has been customary for friends of the civil service to regard all criticism as inspired by unworthy motives and as designed to re-establish the spoils system. We believe this to be an error, and the time has come, in our judgment, for a frank consideration of the faults as well as the good points of the competitive examination system. This is especially necessary, since Congress is to be asked next winter to amend the law by extending the power of the Civil Service Commission over promotions as well as appointments. No apology is necessary for directing the attention of mining engineers to this problem, since in contact with the Land Office, the Forest Service, the Reclamation Service, the Geological Survey, and other branches of the Federal Government, they have especial interest in securing prompt, honest, and efficient service. Such service is only possible when good men are selected for the chief positions and are then given a reasonably free hand. They cannot do good work with poor subordinates.

It will be remembered that as the civil service rules were extended to cover each branch of the service, the men then employed were retained. Indeed, many eleventh-hour appointments were made to sweep in under the protection of the rules those who could not have passed an examination. Therefore the public service now contains many who were originally selected for considerations other than fitness. Many of these, after years of comfortable security, have now passed the age when real work is possible. So long as these men and women can sit at their desks the requisite number of hours per day and days per year they are, practically, secure in their positions. By application of the seniority rule many of them have come to positions of at least minor responsibility and are not only themselves a costly burden, but they misdirect the work of others. It is the most

expensive pension system which could be devised, and it is maintained because of a real or supposed popular opposition to civil service pensions; a not unwarranted opposition when the history of our military pension service is recalled. Be that as it may, many a bureau chief at Washington would gladly undertake to vastly improve the work of his office, without extra appropriations, if he could freely discharge or retire on part pay the incompetents he has inherited.

The present system tends toward the accumulation of mediocrity in the departments. The minor positions are over-paid and the more important ones under-paid. The way is easy for really competent young men, particularly those having some special qualification, into and out of Government service. The departments have become great training schools, and many mining companies, railways, and banks have learned to recruit their staffs from the civil service. The school is peculiar, however, in that most of the dull pupils remain in it for life. Some of the very bright ones do also—men of the highest gifts, who prefer, either because of a love of public service, of scientific research, or from a certain timidity respecting uncertainties which Nathaniel Hawthorne long since showed grows with years of such incumbency, to devote their lives to the work. Such exceptional men carry part of the burden of mediocrity with which they are surrounded, but they are not numerous enough to carry it all. This is the explanation of the well known fact that Government work proceeds slower and costs more than does that of individuals or small companies. Timid men shirk responsibility and hide behind rules. From this comes the maze of regulations and red tape.

Conditions of this kind are not peculiar to the Government service. Universities, churches, railways, and large corporations have the same problems to meet. Many of the largest business institutions in America are so new that they do not yet feel the burden. The Government is our largest business, as it is one of our oldest, and the evils mentioned exist therefore in an aggravated form. The placing of all promotions in control of the Civil Service Commission would still further tie the hands of executive officers and intensify the evils of the situation. By exalting seniority it would produce in the civil service the disgraceful conditions of incompetence which the Army exhibited in the expedition to Cuba, and which the General Staff has been so concerned to overcome.

None but competent men and women should be employed by the Government, and to determine their fitness a rigid examination is right and proper. From among those certified to be competent, however, the man in charge should be allowed to select at will, to pay what the service is worth, to promote according to his own estimate of deserts, and to discharge or retire, as the interests of the work demand. By this system honest, efficient service can be secured. After all, it should be remembered that the civil service exists for the purpose of getting the work of the Government well done. In our desire to be just to the employees let us not be led into injustice to the public.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

ROBERT T. HILL is in London.

GEORGE S. TYLER is in San Francisco.

J. W. GREGORY is in Western Australia.

A. E. BARLOW is ill at Montreal, Canada.

F. LYNWOOD GARRISON is in Los Angeles.

W. F. FERRIER has been in San Francisco.

A. S. HOWE has gone to Hillabee, Alabama.

LANE G. GILLIAM has gone to Cook Inlet, Alaska.

POPE YEATMAN has gone to Alaska for the season.

R. J. FRECHEVILLE is on his way to Pachuca, Mexico.

F. B. TRUDE has returned to Kalgoorlie from London.

A. W. SWEET, of Jessup, Nev., was in San Francisco this week.

F. DANVERS POWER has been in Broken Hill, New South Wales.

S. E. BRETHERTON is expected to return from Nevada today.

PAUL M. PAYNE has returned to San Francisco from Modoc county.

F. L. BOSQUI will return to San Francisco, from Europe, in July.

C. C. SHELBY was in San Francisco, on his way to Seattle and Butte.

ROSS B. HOFFMANN is at St. Petersburg, but will return to London shortly.

C. S. HERZIG was in Kansas City, Missouri. He is going thence to London.

E. T. MCCARTHY has left London to examine mines in the Amur region, Siberia.

HORACE V. WINCHELL returned June 25 from a three months trip to Europe.

RICHARD B. STANFORD, of Cape Gracias, Nicaragua, is at Woodcliff Lake, New Jersey.

J. V. N. DORR has returned to Denver, after spending four weeks in New York and vicinity.

HARVEY & WILBRAHAM have been appointed consulting engineers to the Peña Copper Co., Ltd.

ERNEST WILLIAMS has been inspecting the Gwalia Consolidated mine, at Wiluna, Western Australia.

T. NELVILLE has been appointed manager for the Monte Christo mine, at Darlot, Western Australia.

C. HENRY THOMSON has returned to Los Angeles after nearly a year spent in New York and Mexico.

I. L. HOLMAN, of Camborne, Cornwall, was in San Francisco this week, on his way to British Columbia.

C. J. GARVIN has resigned the general superintendency of the Stratton's Independence, Ltd., and is at Paonia, Colorado.

J. K. FIRTH, who was some time ago with the Joshua Hendy Iron Works, has again joined the staff of engineers of that concern.

D. T. BOONE, L. A. JONES, GEORGE GIDUS, and ALBERT S. CARRUTHERS were among those who went into Fairbanks, Alaska, last month.

GERALD LOVELL, recently superintendent of the Great Fitzroy Mines, Ltd., has left Queensland to take charge of the Burma Mines, Ltd., for Bewick, Moreing & Company.

J. B. FLEMING has completed the installation of a stamp-mill for the Mt. Gains Con. Mining Co. at Hornitas, and is now superintendent for the Globe Light & Power Co., at Daunt, California.

S. F. EMMONS sailed from New York July 3 for London, on his way to Leipsic, where he will represent the National Academy of Science at the five hundredth anniversary of the founding of the University.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, July 8.

| | | | |
|--------------------------|--------------------------------------|--------------------------|------------------------------------|
| Antimony..... | 12-12 $\frac{3}{4}$ c | Quicksilver (flask)..... | 44-44.50 |
| Electrolytic Copper..... | 15 $\frac{1}{4}$ -16 $\frac{1}{4}$ c | Spelter..... | 6 $\frac{1}{2}$ -7 $\frac{1}{4}$ c |
| Pig Lead..... | 4.60-5.55c | Tin..... | 32-33 $\frac{1}{2}$ c |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | July 1. | July 8. |
|------------------------|---------|---------|
| £ s. d. | £ s. d. | £ s. d. |
| Camp Bird..... | 1 8 6 | 1 7 6 |
| El Oro..... | 1 6 3 | 1 7 0 |
| Esperanza..... | 2 15 9 | 2 17 8 |
| Dolores..... | 1 10 0 | 1 10 0 |
| Oroville Dredging..... | 0 13 6 | 0 13 6 |
| Mexico Mines..... | 6 3 9 | 6 3 9 |
| Tomboy..... | 1 2 6 | 1 2 6 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

| Closing Prices. | | Closing Prices. | |
|---------------------------|-------------------|----------------------------|------------------|
| | July 8. | | July 8. |
| Adventure | 67 $\frac{1}{8}$ | Mohawk | 64 |
| Allouez | 41 $\frac{1}{4}$ | North Butte | 52 $\frac{1}{2}$ |
| Arcadian | 4 | Old Dominion | 52 $\frac{3}{4}$ |
| Atlantic | 9 | Osceola | 132 |
| Calumet & Arizona | 103 $\frac{1}{2}$ | Parrot | 30 |
| Calumet & Hecla | 635 | Santa Fe | 2 |
| Centennial | 30 | Shannon | 15 $\frac{1}{8}$ |
| Copper Range | 80 $\frac{1}{2}$ | Superior & Pittsburg | 16 $\frac{1}{2}$ |
| Daly-West | 8 | Tamarack | 70 |
| Franklin | 17 $\frac{1}{4}$ | Trinity | 11 |
| Granby | 99 $\frac{1}{2}$ | United Copper Con. | 37 $\frac{1}{2}$ |
| Greene-Cananea, ctf | 97 $\frac{1}{8}$ | Utah Con | 42 |
| Isle Royale | 24 $\frac{1}{4}$ | Victoria | 4 |
| La Salle | 12 | Winona | 5 |
| Mass | 8 | Wolverine | 148 |

(By courtesy of J. C. Wilson, Mills Building.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|-------------|----------------------|-------|----------|------------------|
| July 2..... | 13.00 | 4.35 | 5.43 | 51 $\frac{1}{8}$ |
| " 3..... | 13.00 | 4.35 | 5.43 | 51 $\frac{1}{4}$ |
| " 4..... | Sunday. No market. | | | |
| " 5..... | Holiday. No market. | | | |
| " 6..... | 13.00 | 4.35 | 5.43 | 51 $\frac{3}{8}$ |
| " 7..... | 13.00 | 4.35 | 5.40 | 51 $\frac{1}{2}$ |
| " 8..... | 13.00 | 4.35 | 5.40 | 50 $\frac{7}{8}$ |

MINING QUOTATIONS—NEW YORK.

| | Closing Prices. |
|--------------------------------------|-----------------------------------|
| | July 1. July 8. |
| Amalgamated Copper..... | 82 $\frac{1}{2}$ 81 |
| American Smelting & Refining Co..... | 92 $\frac{1}{2}$ 96 $\frac{1}{2}$ |
| Boston Copper..... | 15 14 $\frac{1}{4}$ |
| Butte Coalition..... | 25 $\frac{1}{4}$ 24 $\frac{1}{4}$ |
| Cumberland-Ely..... | 7 $\frac{1}{2}$ 7 $\frac{1}{2}$ |
| Dolores..... | 5 5 |
| El Rayo..... | 2 2 |
| Giroux..... | 7 $\frac{3}{4}$ 8 $\frac{1}{4}$ |
| Greene-Cananea..... | 10 9 $\frac{3}{8}$ |
| Indiana Sonora..... | 3 3 |
| La Rose..... | 8 $\frac{1}{2}$ 8 $\frac{1}{2}$ |
| Miami Copper..... | 15 $\frac{1}{2}$ 15 $\frac{1}{2}$ |
| Nevada Consolidated..... | 23 $\frac{1}{4}$ 22 $\frac{1}{2}$ |
| Newhouse..... | 1 $\frac{1}{8}$ 1 $\frac{1}{8}$ |
| Nipissing..... | 10 $\frac{1}{2}$ 10 $\frac{1}{2}$ |
| Ohio Copper..... | 4 $\frac{7}{8}$ 4 $\frac{7}{8}$ |
| Tennessee Copper..... | 38 38 $\frac{7}{8}$ |
| Utah Copper..... | 48 $\frac{1}{2}$ 48 |
| Yukon..... | 4 $\frac{1}{4}$ 4 $\frac{1}{4}$ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

Dividends.

On Saturday, July 3, 1909, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 142 of \$45,000. This makes the amount of dividends paid since January 1, \$390,000, and the total to date, \$11,061,000.

THE STOCK MARKET has been dull this week, with few sales and generally lower prices. Boston copper stocks have nearly all fallen off a few points, with little demand, those purchasing the stock holding it for its intrinsic value rather than for speculative chances. The Southern Nevada stocks also suffered a set-back on the New York Curb, Consolidated and Combination being decidedly weaker.

General Mining News.

ALASKA.

A large body of placer ground on the Beluga river, tributary to Cook Inlet, is being tested by Lane G. Gilliam to determine its value as a dredging property.—A large vein has been found in the neighborhood of Twelve Mile that is an apparent bonanza. A 12-ft. vein has been traced the length of several claims, samples from which assay as high as \$100 per ton.—A number of parties are working on Alder creek and obtaining good results from the sluicing.—The discovery claim on Dome creek is taking out a fair amount of gold.—At Fairbanks creek water is scarce and most of the work is in preparation for the fall run.—Water is short at Goldstream and the output will be much curtailed this year.

ARIZONA.

COCHISE COUNTY.

Developments in the Junction shaft of the Superior & Pittsburg continue to open more ore. On the 1400-ft. level 50 ft. of 12% sulphide ore has recently been developed. The company is at present pumping 4500 gal. of water per minute from this shaft. At the new Powell shaft, stations are being cut on the 500 and 600-ft. levels. The production of Calumet & Arizona and Superior & Pittsburg was 4,600,000 lb. of copper for May, but is somewhat less for June.—The Shattuck company is shipping a few cars of ore per week to the Copper Queen smelter at Douglas and getting good returns. The orebodies on the 600-ft. level continue to open up well.—A cross-cut from the west drift of the Denn struck 4 ft. of ore that assayed about 12% copper.—The Southern Pacific spur from Pearce to Gleeson has been completed and will furnish an outlet for the ores of the Turquoise district.—W. C. Humphrey has bonded five claims at Courtland from D. W. Brown for \$75,000.—George Woodward has bonded the Nina Blanca property near Wilcox for \$30,000.—The Arizona United Mines Co. is to erect a 125-ton smelter on its property at Johnson at an approximate cost of \$50,000. Wilson H. Brown is manager.—The June output for the Copper Queen smelter was a little over 9,000,000 lb. This is an increase of 10% over last year's monthly production. George B. Lee is superintendent.

GILA COUNTY.

A new head-frame has been erected by the Arizona Commercial Copper Co. and a new cable wound on the hoist. The steel-work of the furnace building is complete.—A new concentrator is being installed by the Cactus Development Co. at Crowley City. A double-drum hoist is on the ground and will be set up shortly at the Hamilton shaft. W. H. Hamilton is mechanical engineer for the company.

MOHAVE COUNTY.

The shaft on the Holy Moses mine, south of Kingman, is being sunk to the 200-ft. level. The ground at the 100-ft. level is much broken, although some ore was found above that level, which was recently tried out in the mill with gratifying results.—The shaft of the Enterprise mine is being sunk to the 300-ft. level. W. J. Martin is the owner.

PIMA COUNTY.

The Imperial Copper Co. in the Silver Bell district is sending about 750 tons of ore per day to the Sasco smelter.—The Southern Arizona Smelting Co. is to enlarge its Sasco smelter. Two furnaces with a daily capacity of 350 tons each are to be added, one of which will be run entirely on custom ore.—The Victoria company, which is operating the old Paymaster mine, is sinking the old shaft from the 320-ft. level. The ore is hauled to the railroad at Twin Buttes and shipped to the smelter. C. T. Roberts is manager. The Esperanza property, under the same management, is making occasional ore shipments.—In the Helvetia district the Helvetia Copper Co. is shipping 60 tons of ore per day to the Old Dominion smelter at Globe. W. C. Steubing is manager.—The old Total Wreck mines, about 10 miles south from Pantano, have been re-opened and the company is developing some high-grade lead-silver ore. The

Southern Pacific railroad is to build a spur to facilitate the shipment of ore.

PINAL COUNTY.

(Special Correspondence).—The Ray Consolidated Copper Co. has commenced grading for a broad-gauge railroad between Ray and Kelvin. The mill is to be built at Kelvin or between Kelvin and Winkelman. The company is to add three churn-drills to its prospecting machinery.—The Ray Central Copper Co. is sinking one new shaft and blocking out ore from the lateral working of the other two.

Ray, July 5.

YAVAPAI COUNTY.

The Lookout mine in the Big Bug district has been bonded to Peter Laux of McCabe. The shaft which is down 150 ft. will be unwatered and sunk to the 250-ft. level.—An important strike has been made at the Little Daisy mine at Jerome. The cross-cut on the 800-ft. level cut three lenses of ore 107 ft. northeast of the shaft that assayed well in copper and gold. J. J. Fisher is manager.—A Burnham sinking pump with a capacity of 1200 gal. per minute has been installed at the Pick and Drill mine in the Bradshaw mountains. Sinking on the vein will be resumed at the 346-ft. level. The 6-stamp mill on the property is kept busy on ore from the development work. S. J. Gnash is superintendent.—The Mudhole mine in the Walker district is now unwatered to the 500-ft. level. The new shaft on the southern end of the property is down 175 ft. and cross-cuts are being run to the vein from that point.—The Champion mine is being unwatered under the supervision of John Edwards.—The Blue Bell mine of the Arizona Smelting Co. is to be unwatered and operations resumed at the Humboldt smelter.

YUMA COUNTY.

A number of prospects in the Winchester district are getting good ore on their properties. A shaft is down 30 ft. on a 3-ft. vein on the Anaconda property.—On the Big Horn property several small shafts have cut ore. W. G. Leftwich, of Phoenix, is in charge of the work.—The Yuma Copper Co. is sinking several prospect shafts.

CALIFORNIA.

ELDORADO COUNTY.

The old Two-Channel gravel mine on the Georgetown divide is to be re-opened. The old company has re-organized and will attempt to work the mine on a larger scale. F. W. Hunton is manager.—The Vandalia mine, four miles below Shingle Springs, was sold by Louis Rosenfeld to Frank P. Merrill and Charles E. Seymour.

INYO COUNTY.

The Birch Creek placer mine has been taken over by C. A. Curl and associates of Riverside. A No. 2 Giant has been installed, 1500 ft. of pipe laid, and the sluices built to handle a large amount of gravel that runs from 20c. to \$2 per cubic yard.—The Casa Diablo Mining Co. shipped two carloads of concentrate to the smelter that assayed \$65 per ton.

MARIPOSA COUNTY.

The Number Five Mining & Milling Co. is sinking its new shaft to the 200-ft. level. At the 100-ft. level a drift was run 300 ft. on the ore and cross-cut driven across the vein 56 ft. A hoist and compressor is to be installed shortly. Hugh Branson is in charge of the work.—The shaft of the old Number Nine mine is being re-timbered to the 250-ft. level and drifts will be run from that point. Richard O'Brien is superintendent. The Quartz Mountain mine under the same management is sinking a shaft on that property.

MONO COUNTY.

Malcolm Macdonald has taken over the property of Tom Neylon in the White mountains under a \$30,000 bond. The claims, 10 in number, are opened by a 1200-ft. adit and join the True Fissure property.

NEVADA COUNTY.

(Special Correspondence).—Sinking at the Empire will start as soon as the new plunger pumps have been placed in first-class working condition. Bonanza ore continues to come from the property, while the 40-stamp mill is operating steadily on ore said to average \$25 to \$40 per ton. George

W. Starr is manager.—Work on a small scale is going on at the Spring Hill.—The 8-ft. vein on the 500-ft. level of the Idaho-Maryland is showing well as developments progress. Bray Wilkins is manager.—It is reported that a 12-ft. vein of \$8 ore has been uncovered at the Mammoth.—The California-Grass Valley Mining Co. has decreased its capital stock from \$300,000 to \$100,000.—The Middle Yuba Hydro-Electric Power Co. is arranging to extend power lines to the Graniteville and Washington districts. This will facilitate the operation of numerous mines at these points that in the past have been handicapped for want of sufficient power.—The geology class of the University of Nevada is studying the formation in the Grass Valley and Nevada City mines. W. S. Tangier Smith is in charge of the party.—With the exception of the pumps, everything is idle at the Murchie mine. Several attachments have been levied against the property.—The work of developing the foot-wall vein at the Champion is progressing. Thirty stamps are in active operation.

Grass Valley, July 6.

A dividend of 4% on its capital stock has been declared by the North Star Mines Co. The sum amounts to \$100,000, which is at the rate of 16% per annum. Last year the company earned sufficient to pay 15%. The shaft is now down over a mile on the incline.—A mill-site for a 20-stamp mill is being surveyed at the Fairview mine. It is hoped to have the mill in operation by fall.—The Red Cross mine in the Washington district has been sold to I. S. Pine and E. J. Dean. There is a 6-ft. Huntington mill and a 20-stamp mill on the property. The adit, now in 400 ft., will be driven 300 ft. more to cut the vein. This will give 250 ft. of backs on a vein that has been from 12 to 20 ft. wide when worked in a large open-cut. The same parties have purchased the Sunshine mine on Poorman's creek. The vein is on a serpentine contact, and varies between 5 and 30 ft. in width. A drift will be run along the vein that will give several hundred feet of backs, and a 5-stamp mill will be erected.—The cross-cut adit at the Oakman mine on Poorman's creek cut a vein that assays between \$15 and \$20 per ton. The vein was 20 ft. wide at the point cross-cut by the adit. Frank Dillon is superintendent.—Ten stamps are dropping regularly at the Ancho mine at Graniteville. George Mainhart is the owner.—The 30-stamp mill at the Erie mine is to be started in a short time.

SAN BERNARDINO COUNTY.

The first carload of ore from the Jumbo mine averaged over \$100 per ton. In the east cross-cut from the 100-ft. level 15 ft. of \$25 ore has been cut.—The shaft of the Oro Belle is down 250 ft. From the 200-ft. level the east cross-cut is being run to cut the Fraction vein and the north drift on the adit level has been driven 300 ft. along a vein of excellent milling ore.—The Acme Mining Co. is erecting a 5-stamp mill at its mines in the Signal Mountain district 20 miles south of Hart and has let a contract to sink the shaft from the 100 to the 200-ft. level.

SHASTA COUNTY.

A 4-ft. vein of good ore was cut in Pierson & Nuser's Milk Maid property near Stella at a depth of 80 ft. The 20-stamp mill is being equipped with electric power.—E. P. and James G. Conner have secured a two-year bond on the Flske-Purcell group 10 miles east of Harrison gulch.—The Mad Ox mine near Whiskytown has been bonded to H. L. Berkey.—The smelter of the Mountain Copper Co. at Keswick is to be enlarged to treat the ores from the Hornet and Iron Mountain mines.

SIERRA COUNTY.

The Colombo mine near Sierra City has been bonded to W. R. Warton of Los Angeles.—Another pocket has been cut in the raise of the Sixteen-to-One mine 50 ft. above the former strike.—The Excelsior gravel mine near Port Wine is to be opened shortly. A channel of pay-gravel is known to cross this claim.—The Gold Standard Mining Co. is driving a drift to open the quartz vein on the Slate Castle-Jaffa claim east of Downieville. J. W. Henderson is manager.—The 12-stamp mill at the Primrose mine in Hog canyon has been started. George Morrison is in charge of the work.—The old adit at the Monte Cristo gravel mine

is being re-timbered and will be driven about 400 ft. to cut the channel. Fred Phelps is superintendent.—W. A. Wood, W. Brusi, and J. R. Van Flat have taken a bond on the holdings of the Bunker Hill Mining Co. between Downieville and Poker Flat and will sink bore-holes to determine the extent and value of the channel.—The Alaska mine at Pike City has been drained and the mill will be started shortly.—The old No. 6 adit of the Sierra Buttes mine is being re-opened.

TUOLUMNE COUNTY.

The Atlas mine in the Jackass Hill district has been bonded by Fred Sutton to R. B. Lucas and Edwin S. Bennett.—L. Baun and L. McRae have taken a bond on the Ida Cline mine. The water has been pumped out to the 60-ft. level and work at that point has opened some high-grade ore.—Work has been resumed at the Never Sweat above Columbia.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work was resumed last week upon the Central Colorado mine on Leavenworth mountain. Charles R. Iliff is manager.—E. F. Byers has secured a lease upon a big block of ground on the Pelican vein, and will work it through the Diamond adit of the Nashotah Mining Co.—The Nashotah Mining Co. is preparing to resume work upon a large scale.—The Mendota Mining Co. is shipping about 60 tons of zinc, 80 of lead, and 125 iron concentrate per month.—A new strike has been made on the Big Indian mine on Leavenworth mountain. A streak from 6 to 10 in. wide assays 2.5 oz. gold and 122 oz. silver per ton, with 10% copper.—J. Nash has been awarded a contract to drive the Prudential adit 200 ft. at the price of \$12 per foot.—A shipment of 20 tons of lead ore was made last week from the Scott mine, which was settled for at the rate of 65% lead and 70 oz. silver per ton.—The Linn Consolidated Mining & Milling Co. shipped two carloads of lead and zinc concentrate during the last week. C. E. Pughe is manager.—The Santiago mine at East Argentine is to double its output shortly, which will raise its shipping product to 150 or 160 tons daily. William Rogers is manager.—C. J. Evans & Co. has taken a lease upon the Doric adit dump and has installed a washer and sluice.—An 18-in. streak of smelting ore has been cut by the adit in the Mountain Queen property at Dumont, which assays from \$55 to \$60 per ton. Fred Pilling is manager.—A small amalgamating mill has been constructed at the Little Flat mine up Ute creek by the owner, C. M. Taylor, of Idaho Springs.—Construction work is under way upon the 300-ton reduction plant at the Alice mine. It is hoped to have the mill ready for ore treatment by September 1. A. H. Roller, of Idaho Springs, is manager.

Georgetown, July 3.

EAGLE COUNTY.

The Gold Curve Mining Co. has been incorporated to work the placer deposits of the Grand River country near its north line. J. C. McClintock is at the head of the company.—Two new pumps have been installed at the Champion lease and the mine unwatered.—At the Enterprise in Eagle canyon a compressor plant is being installed and a drift will be run along the vein. Thomas Keating is in charge of the work.

GILPIN COUNTY.

The Daisy mill has been started crushing ore from the Burnell property on Perigo hill. Al Bailey is in charge.—Potter & Lightbourn have started the Perigo mill on the Perigo and Comstock ores.—A contract has been let to drive the main adit of the Penobscot property. A test lot of ore from the McCartney vein assayed well in copper and gold.—A new boiler has been installed in the Evergreen mill and a hoist to raise the ore from the old dump to the ore-bins.—Development work has been started on the Seabird group in Moon gulch.—The Mountain Monarch Mining Co. has resumed operations at its mine in Gamble gulch, with M. S. Shanks for superintendent.—E. M. Green shipped a car of tungsten ore from Camp Manchester to the Nederland mill.—H. P. Lowe and S. T. Harris are operating the Rockford mine in Russel gulch.—A new

water-skip has been installed at the Pewabic mine.—The Aztec Mines Co. has installed an electric pump on the 620-ft. level of the O. K. mine.—A 5-drill Rand compressor was delivered to the Pearl Tatum Mining Co.—Westcott, Leverton & Co. received \$125 per ton for a small shipment of ore from the Russell mine.—The Gregory vein has been opened at the 1400-ft. level by the Fifty Mines Co. and drifts run along it for 50 ft. in each direction. The mill is handling from 150 to 200 tons of ore per day.

LAKE COUNTY.

The Tribune lease, which is being worked through the Yak adit, has cut 100 ft. of ore. L. R. Johnson and T. M. Howell are the owners of the lease.—The Matchless lease is shipping regularly from the No. 6 and No. 7 shafts. Lessees on the old Chrysolite mine on Fryer hill are making regular shipments.—The mill at the Lillian mine on Printer Boy hill is crushing ore taken out by lessees. Wallace Murcay holds a general lease on the property. John Withney has a lease on the dump and is working about 150 tons per day.—The Houston adit, which taps the Ella Beeler, Little Alice, Ready Cash, and other claims, is leased to A. S. Sharp.—The Helena mine is to be re-opened shortly.—An 32-hp. motor has been installed to run the hoist at the Valley shaft in Big Evans gulch. Warren F. Page is manager.—George Bennett, David Harris, and C. A. Edwards are shipping 50 tons of ore per day from their lease on the Hibschie and Coronado mines.—The Yankee Doodle property on Carbonate hill is shipping one carload of smelting ore per day.

SAN JUAN COUNTY.

A compressor and engine is to be installed at the Hermes mine near Animas Forks. H. M. McGrew and F. D. Fowler are the principal owners.—The Danville Mining Co., operating a lease on the Shenandoah mine, has completed its new ore-bins and is shipping regularly.—The mill of the Gold Prince, which was injured by a snow-slide last winter, is being repaired and enlarged. Several Card tables have been added to the equipment. J. O. Campbell is in charge of the work.—The Koehler adit of the San Antonio Mining Co. is being driven to cut the vein at a point that will give 500 ft. backs. M. T. Chestnut, of Denver, is president.

SAN MIGUEL COUNTY.

A dividend of 48c. per share has been declared by the Tomboy Mining Co.—At Ophir loop the Butterfly mine is being operated by the Buckeye Leasing company. The mill is crushing 80 tons of ore per day.—The dump of the Smuggler-Union, which averages about \$8 per ton, is being worked by lessees, their rock being crushed in the old mill. The new mill has been idle this winter, owing to an excessive amount of water in the mine, but will be started early this month.—The King mill and cyanide plant is to handle the ore from the Summit lease.—The Waterfall mine near Ophir shipped a carload of ore to the Salida smelter that assayed \$19 gold, 95 oz. silver, and 48% lead per ton.—At the Black Bear mine cross-cuts are being driven to tap the Bradley and Smuggler veins. Oscar Mantyla is president of the company.

SUMMIT COUNTY.

The Central Colorado Power Co. has contracted to supply the Hamilton mine with electric power by the 15th of this month. An adit is to be driven near the Swan river that will give 1200 ft. of backs on the Hamilton and Action groups.

TELLER COUNTY.

The Robert Burns mine on Guyot hill, adjoining the Katinka Gold Mining Co.'s estate, has been leased by Newt Wilson, manager of the Robert Burns Mining Co., to George Hawkins and associates of Cripple Creek, and the Jay Bird and Maid, two fractional claims on Bull hill, containing about four acres, adjoining the War Eagle and Ramona mines, have been leased to R. G. Harrison, of Colorado Springs. The leases on both the Bull and Guyot hill properties cover a two-year period and the lessees will pay a graded royalty of from 15 to 30% on all ores marketed.—A three-year lease and bond has been secured on the North Cascade claim on Beacon hill by A. Norden.—A new lease has been granted to the Clements Leasing Co. on the prop-

erties of the Gold Sovereign Mining & Tunnel Co. Heavier machinery will be installed and development started on the 1000-ft. level. W. H. Clements is manager.—The return on 26 tons of ore shipped from the 300-ft. level of the Aileen mine on Raven hill was \$32 per ton.—A small sacked shipment containing 1254 lb. mined by George Morrison from a block of ground at the 100-ft. level of the American Eagle mine was settled for at the rate of 59.54 oz. gold per ton.—Prospect work has been commenced at the main shaft of the Gold Sovereign by W. H. Clements.—Lessees have cut a new ore-shoot in the Coriolanus mine on Battle mountain. A test lot was shipped, and if the run proves successful more will follow.—E. J. White, leasing on the World's Fair mine on the southern spur of Gold hill, owned by the Gold Bond Consolidated Mines Co., is shipping ore carrying 2 oz. of gold.—Due to extensive development work the production made from the Modoc mine, in the saddle between Bull hill and Battle mountain, was unusually light last month, but it is understood that new orebodies have been disclosed and the July production will show material increase. Two cars were shipped from the mine and consigned to the Eiler smelter at Pueblo, the ore being estimated at 2-oz. grade.—Work has commenced on the excavations and road-bed at the site of the new mill to be constructed by the Portland Gold Mining Co. on Battle mountain for the local treatment of such low-grade ores as will not pay for the transportation to the mill of the company at Colorado City. The plant is to have an initial capacity of 300 tons per day, and will be so constructed as to permit of enlargement. The mine is shipping between 200 and 250 tons per day to the Colorado City plant, and this tonnage will be maintained.

IDAHO.

IDAHO COUNTY.

The old shaft of the Independence group is being unwatered and sinking will soon be resumed. Some good ore has been found on the old vein. J. Rogers is in charge of the work.—Two large cyanide tanks are being added to the Buster mine equipment.

KOOTENAI COUNTY.

The Knickerbocker Mining Co., operating the old Charles Dickens mine in the Coeur d'Alene district, has sent two cars of ore to the smelter at Tacoma and is getting out 90 tons for a second shipment to be made this month. A. D. Gritman is manager.—A shipment of ore from the upper workings of the Silver Cliff Co.'s property assayed 23% copper, 35 oz. of silver, and \$15 gold per ton.—The Granite and Allie claims will ship concentrate as soon as the 10-stamp mill can be converted into a 40-ton concentrator. The mill was planned for a free-milling ore, but the character of the vein changed to lead-silver with depth. The vein is 32 ft. wide with 24 ft. of concentrating ore.

NEZ PERCE COUNTY.

The drift in the lower level of the Silver Cliff near Look-out has cut some 2% copper ore. James D. Young is manager.

OWYHEE COUNTY.

E. I. Field, of Denver, has bonded the Empire claims on War Eagle mountain.—The adit of the Banner mine is in 1300 ft. and has cut some stringers of quartz. Peter Steele is manager.

SHOSHONE COUNTY.

The face of the drift on the Torino group is in ore that assays well in copper and gold.—The cross-cut adit of the Helvetia property, near Wallace, cut a small vein of shipping ore. The adit will be driven 60 ft. to cut the main vein.—The cross-cut on the Coeur d'Alene Vulcan property is in 850 ft. and has cut a number of small veins of galena ore.—The Butte & Coeur d'Alene Mining Co. is to sink a 500-ft. double-compartment shaft and cross-cut to the vein at the 200 and 400-ft. levels. James Quinlan is manager.—The Caledonia mine at Wardner sent five cars of ore to various smelters in June with satisfactory results. The ore was extracted from the cross-cut 300 ft. from the surface.—The drift on the Star property near Mullan opened a 7-ft. shoot of lead-silver ore.—The Lucky Calu-

met Copper Co. has let a contract to John H. Nordquist to drive an 1800-ft. cross-cut on its property near Mullan.

MICHIGAN.

The Winona Copper Co. has let the contract for the structural steel that will be used in the construction of the mill, and it is expected that the first of the steel will be delivered in about 90 days. The completion of the excavation work will be followed immediately by the laying of the mill foundations. Operations in the mine continue centered in opening work, with uniformly good results, particularly to the southward. The mine is opened fully five years ahead of requirements and in shape to begin producing at the rate of 1000 tons of ore per day. The mill is expected to be in commission by June 1910.—The Lake and North Lake companies are arranging to begin diamond-drilling jointly, each bearing half of the expense, near the boundary which separates their properties. The results of such an undertaking will be the finding of the extension of the Lake lode northward from the Lake mine and southward from the North Lake's present diamond-drill work. The proposed point of operations will be about 4500 ft. north of the Lake shaft. The fourth level in the Lake, now run about 20 ft. each way from the cross-cut that exposed the lode, is opening first-rate stoping ground. It is not as rich as the remarkable ground exposed at the third level, but is considerably richer than the average amygdaloid of the district.

MONTANA.

BROADWATER COUNTY.

The south shaft on the property of the Ohio-Keating Mining Co. is being re-timbered and will be sunk from the 125 to the 225-ft. level. A drift has been run 90 ft. from the 120-ft. station. Ore taken from the 120-ft. level of the north shaft assayed \$64 per ton and surface samples taken to the north of this shaft ran from \$30 to \$78 per ton. The ore carries a high percentage of iron and makes an excellent flux for the smelters.

SILVER BOW COUNTY.

The Butte Central Copper Co. is moving its boilers near the shaft and adding another boiler to the battery preparatory to unwatering the Ophir mine and resuming development work. The company proposes to build a concentration plant to treat the vast quantity of low-grade silver and copper ore in its upper workings, while sinking the shaft deeper and opening the lower levels.

NEVADA.

DOUGLAS COUNTY.

A 40-ton centrifugal mill has been installed by the Pine Nut Consolidated Mining Co. near Gardnerville. The plant is now equipped to crush and cyanide about 60 tons per day.

ESMERALDA COUNTY.

(Special Correspondence).—The Gold Reef lease on Queen Bethania is sinking a new shaft on the Bridge-Daniels vein. A 4-ft. streak near the surface assays \$6 per ton.—The Lawyers lease on Bethania Mines ground is sinking the shaft to the 100-ft. point. As soon as the new hoist has been placed the shaft will be crowded rapidly. A 14-ft. body of \$12 ore has been opened.—Several claims that have laid idle for months are again being worked. The good showing of Queen, Coalition, Bethania, and one or two other mines is doing much to justify the early predictions regarding Rawhide, and the operation of several mills is also aiding developments.—The Lodi Mines smelter at Luning has been blown in and is receiving ore from several points. Mines that have laid idle for years on account of lack of milling facilities are taking on a new lease of life.—The Gold Mountain district, south of Goldfield, is attracting considerable attention. The Mammoth company has opened large reserves of ore and is building a 35-ton plant.—The Nevada Empress has opened several veins running about \$25 per ton. It is planned to increase the capacity of the plant.—The Great Western has been acquired by Philadelphia people. New machinery will be installed and the mine operated extensively.

Rawhide, July 5.

The raise in which the rich strike was made at the Golden

Daisy lease at Diamondfield a short time ago continues in good ore. The lease covers a block of ground 300-by 600 ft. 800 ft. from the main Daisy workings and runs for three years. H. A. Morrison owns the controlling interest.—The cross-cut from the 400-ft. level of the Mint lease at Rawhide struck a good body of ore.—The shaft on the Miller lease is to be sunk to the 200-ft. level and drifts run from that point.—On a 98-ton shipment from the Truett lease to the Murray mill the return was about \$30 per ton.—The Grutt-Balloon Hill lease shipped 50 tons of ore that assayed \$2000 per ton.—The Marigold lease is shipping 25 tons of ore per day that mills between \$18 and \$30 per ton.—The McCormick lease on the Lucky Boy claim is shipping about four cars of ore per week to the Salt Lake smelters. J. C. McCormick is the principal owner of the lease.—A 4-in. vein of lead-silver ore has been opened on the property of John Miller on Mt. Corey, 8 miles from Luckyboy.

HUMBOLDT COUNTY.

The old Arizona mine at Unionville has been sold. The high-grade ore will be shipped to one of the Shasta county smelters and the low-grade stored for the mill which is being re-built and enlarged. The sale was made through H. D. B. Haysted, of Lovelock.

NYE COUNTY.

(Special Correspondence).—While people continue to pour into Elendale, developments have not been of such a nature as to encourage the disgusted arrivals. Surface indications are excellent, but the Cliffords, the original locators, are doing nothing to prove the persistence of the orebodies. Despite the extravagant claims made by the Cliffords, they have not sunk even a 10-ft. shaft, and seem disposed to have someone else risk their money in such an enterprise.—It is reported that the Bullfrog Gold Center Mills Smelting Co. will erect a 250-ton smelter before the end of the year. The company controls 400 acres of placer lands and several quartz properties.—It is unofficially reported that the original Pioneer lease has posted a dividend of 5c. per share and that others will follow unless operations are stopped by litigation.—Excavating and grading for the new Tonopah Extension mill is progressing rapidly. The Union Iron Works of San Francisco has been awarded the contract for supplying 30 stamps, mortars, cam-shafts, ore-feeders, etc.—The Montgomery-Shoshone mine is producing at the rate of 210 tons per day. The June yield was approximately 6800 tons. Owing to the breaking of the dam at Bishop the mine and mill were idle for two days because of lack of power. Cross-cutting and driving from the 400-ft. level is progressing.

Tonopah, July 3.

A dividend of \$32,000 was paid by the Round Mountain Mining Co.—The Lemon mill and cyanide plant has been leased by Eugene Howell, Gilbert C. Ross, and L. L. Nushett to handle the ores from the Manhattan-Thanksgiving, Earl, and Gold Crater claims.—Lateral work from the 100-ft. level of the Keane Wonder has cut 40 ft. of milling ore.

WHITE PINE COUNTY.

A 3-compartment shaft is to be sunk to the 600-ft. level on the Eureka Fraction claim of the Ely Central group. The shaft will be within 600 ft. of the pit, as good ore has been cut by bore-holes within that distance. O. A. Turner is in charge of the work.

UTAH.

BEAVER COUNTY.

The Utah Mining, Milling & Transportation Co. is to sink a new double-compartment shaft to the 200-ft. level and cross-cuts run to the orebodies from that point. The company has recently acquired the Lady Bryan property from Cullen & Moritz. Charles T. Birchard is president.

JUAB COUNTY.

At the Provo property of the East Tintic Development Co. a cross-cut has been started from the 300-ft. level to tap the orebody.—The new shaft of the Tintic Standard is down 125 ft. Oscar Radditz is superintendent.—The Chief Consolidated is now making small shipments regularly.

SALT LAKE COUNTY.

The property of the Emma Copper Co. at Alta has been attached by the Utah Mining Machinery & Supply Co. for a bill of \$1100.—The shaft of the Last Chance mine in the Big Cottonwood district cut a 6-in. vein of lead-silver at a depth of 70 ft. W. P. Worthen is manager.—A contract has been let to W. T. Quinn to drive 100 ft. of adit on the Old Glory property.

SUMMIT COUNTY.

The shaft of the American Flag mine is down 1100 ft. with considerable development work on each level. Howard P. Saunders has been examining the property to determine the best form of mill to be erected on the property.

UTAH COUNTY.

The cross-cut adit of the Mineral Flat mine in American Fork canyon is in 1300 ft. This is being driven to cut a vein of galena ore on a lime and porphyry contact.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—During the lease of the Insurgent mine, which terminated recently, 671,892 tons of ore was shipped to the smelters, which assayed 1.21 oz. gold and 6.65 oz. silver per ton. The entire gross value of the output was \$18,477.—The lessees of the Lone Pine claim of the Pearl Consolidated Mining Co. have cleaned out the old Jim Clark adit and will drive it 175 ft. to intersect the No. 4 Lone Pine vein 80 ft. below the old workings, from which considerable rich ore was extracted in former days. The lessees have shipped eight carloads of ore to date from the main Lone Pine vein.—The lessees of the San Poll mine have installed a new 3-drill compressor. They have shipped three carloads of ore and expect to ship a carload per day, as soon as the New Republic Co. can furnish power.—The New Republic Co. has started its electric plant and is preparing to furnish power for the Republic, San Poll, and Black Tail mines.—Some fine ore is being extracted from the surface working of the Ben Hur mine.—The Colville Mining & Smelting Co. has resumed work on the Mountain Boy, Summit claims, and smelting plant, at Park City camp, with William M. Crummer as superintendent.—A 7-hp. gasoline engine has been installed at the Advance mine in Meteor district, to be used for driving a fan, hoisting, and pumping from the winze which has been sunk in the ore.—A test shipment of ore from the Longstreet mine has been sent to the smelter from Covada camp.

Republic, July 5.

STEVENS COUNTY.

The Imperial Copper Mining Co. is installing machinery at its property near Chewelah under the supervision of P. J. Bonner.

CANADA.

ONTARIO.

The Coniagas Mines Co. is to double the capacity of its mill by adding 30 stamps. This will handle from 150 to 160 tons of ore per day and produce about 4 or 5 tons of concentrate. The outlay for the additional facilities will be approximately \$40,000.—The Kerr Silver Mining Co. at Peterson lake cut an ore-shoot in the south drift 85 ft. from the 125-ft. level of its shaft.

BRITISH COLUMBIA.

A rich body of carbonate ore has been cut in the Whitford & Jenkins lease on the Blue Bird mine in the Slocan district. The ore assays well in silver and gold.

MEXICO.

DURANGO.

The report of Frederick Stallforth, president of the Mexico Consolidated Mining & Smelting Co., shows that the old debt has been paid off, a new cyanide plant installed, and a large quantity of milling ore opened on the seventh and eighth levels. J. J. Welsel is consulting engineer for the company's property at Guanacevi.—The Boca del Cobre mine in the Nazes district is working on a body of ore 20 ft. wide that averages about 5% copper and 90 oz. silver per ton. The property paid \$20,000 net during June, and

will pass \$25,000 in July. The ore being opened on the fifth level is better than that previously worked, running between 5 and 6% copper and over 100 oz. silver per ton. The shaft is being sunk below the sixth level and the station cut at that point.

SONORA.

The Silver Seal Mining Co., which owns 325 acres near Nacozari, struck a good body of ore in its cross-cut adit. The ore is being shipped to the Copper Queen smelter at Douglas.—The El Van Copper Co. is doing about 500 ft. of development work monthly. Fritz Kohlmeier is manager.—The Ey Aguaje mine, of the Ey Aguaje Mining Co., is being unwatered.—The La Carida mine is opened so that ore shipments can be resumed any time the company wishes to do so. A. L. Godbe is in charge of the work.—The Dawson Mining Co. has ceased operations at its Creston de Oro property.—The Banco de Sonora of Hermosillo has taken over the Lampazos group of mines under a mortgage held by them for \$800,000.—Cross-cuts from the 200-ft. level have been run to the orebodies of the Monte Cristo mine of the Moctezuma-Duluth Development Co., and opened ore that runs 700 oz. silver per ton, which is being shipped to the Arizona smelters.—The Washington mine of Bostwick & Dickson is reported sold to the Calumet & Arizona Copper Co. for the sum of \$250,000.—The Minneapolis Copper Co. has resumed operations under the management of Tom L. West.

PHILIPPINE ISLANDS.

Strikes of good ore are reported from the Paracale district in the Camarines province and from the Baguio dis-



Philippine Islands.

trict in the Benguet province. Both properties are doing development work on quartz veins along which surface work has disclosed some excellent ore. A dredge has been working in the Paracale district for the past year and two more are soon to be constructed.

Special Correspondence.

LONDON.

Radium Developments.—Phoenix Tin Mine.—Great Cobar.

The British Metalliferous Mines, Ltd., has contracted with the trustees of the British Radium Institute, recently founded for medical research, to supply $7\frac{1}{2}$ grams of pure radium bromide, at the price of £4000 per gram. The company owns the celebrated uranium mine at Gram-pound Road in Cornwall, which has been producing pitchblende for a great many years and selling it for its uranium value. This present deal is the first in which English pitchblende has been sold for its radium value. The actual extraction and production of the radium bromide will be done by Buchler & Co., Braunschweig, Germany. I am also informed that the St. Ives Consolidated, which owns the Trenwith mine in Cornwall, will shortly enter the market with radium. Sir William Ramsay has been conducting extensive experiments on the Trenwith ore. He has recently elaborated an improved method of extracting the radium content, and the St. Ives company has determined to adopt the process.

The Royal Family are considerable landowners in East Cornwall and Devonshire and in several of the districts they are also the owners of the mineral rights. A fortnight ago the Prince of Wales, in whom the title rests, paid a semi-state visit to the Phoenix mine near Leskeard. This mine has been requiring further funds for development for some time, so the Prince's visit was opportune. The mines were worked for many years until 1897, when the decrease in tin content of the ore, combined with the low price of metal, made it necessary to close down. A few years ago the Cosmopolitan Proprietary, until then identified with West Australia, acquired the property and spent large sums of money in re-opening it. The mine has this week been floated as a separate company with a nominal capital of £160,000, of which £60,000 in shares goes as purchase price to the vendors, the Cosmopolitan company, another £60,000 is being subscribed in cash by the vendor company and its friends, while the remaining £40,000 is being offered for public subscription. A new main shaft is being sunk to the 1020-ft. level, where the old workings ended, and machinery is being provided. The prospectus is not as clear as it might be. The output for the years 1877 to 1897 is given, and the average recovery over these years, 36 lb. of black tin per ton, is taken to be the average for the future. In addition an extra 20% recovery due to improved plant is assured. On looking at the returns for twenty years it is evident that the decline has been steady: In fact, during the years 1877 to 1887 the average production was 44 lb. per ton, but since then it has steadily and regularly dropped until it was only 27 lb. in 1896 and 1897. It seems, therefore, that 36 lb. can hardly be counted on for the future. However, there is no reason why 27-lb. ore, if found in quantity and treated in a modern way, should not earn substantial returns.

There has been considerable wonderment in London as to why the Great Cobar has not done as well as was expected. This mine, one of the best known producers of copper in Australia, was floated in London over two years ago, and last year the new smelters were put into commission. This smelting plant was as up-to-date as possible, and was supplied by an experienced American house, but kept breaking down. It became necessary for the consulting engineer, J. D. Kendall, to proceed to the spot six months ago. He has just returned and is very severe on G. H. Blakemore, the general manager of the company, for the failure. I do not intend to quote details, as I have not heard the other side. It may not have been the fault of the general manager. It may have been the absence of a smelter manager. Anyway, it appears that the three great blast-furnaces all went wrong, and the settlers as well. The company has appointed H. C. Bellinger, of Salt Lake City, Utah, formerly with the Bingham Consolidated Mining & Smelting Co., to take charge of smelting operations, and the plant is now getting into better shape.

WASHINGTON.

European Zinc Trust.—Tariff on Oil, Monazite, and Tin.—Monazite Sands in Brazil.—German Competition.

H. A. Johnson, American Consul at Liege, Belgium, has written concerning the formation of a European zinc trust. He declares that an international agreement has been concluded between a number of prominent zinc works, resulting in the organization of what is designated as the 'Syndicat des Usines a Zinc'. The Consul says: "The limit of production of each of the firms having been established, the principal clause of the agreement stipulated that should the current price of zinc fall below \$92.46, or should the accumulation of stocks show an unusual increase, production would be proportionately reduced. If, on the other hand, the current price of zinc continues to be above \$92.46, this limit of production may be increased as arranged in virtue of an agreement between delegates from each group of concerns making up the trust, which includes German, Belgium, and English concerns, although it seems that agreements have not yet been concluded with the last mentioned. It is asserted that the works of H. G. von Giesche, a concern that is said to produce one-fifth of the total output of the zinc in Silesia, are not included in the new combine, whose main object is to regulate production, but competition from this quarter apparently is not feared. Steps have been taken to induce the five most important zinc works in England to join the trust. As to the zinc works of the United States, it is believed that anything like extensive exports of zinc from that part of the world are too far in the future to need serious consideration at the present time. It is rumored that one of the earliest results of the formation of this trust will be an increase in the present price of zinc, such an advance having already been definitely decided upon." A supplementary report states that the syndicate was organized as a limited liability company. The capital is said to be \$509,400, and the management is placed in the hands of the director-general of the Hohenlohe works. The sale of zinc will be effected through the agency of Beer, Sondheimer & Co., the Metal Gesellschaft of Frankfurt-on-the-Main, and by Aaron Hirsch, of Halberstadt.

The surprise of the extraordinary session was the defeat of the amendment to the tariff bill proposed by Boise Penrose, Senator from Pennsylvania, placing a duty of $\frac{1}{2}$ c. per gallon on crude petroleum. It was practically agreed that the independents had made their case and that they would get a duty on the crude petroleum, but when the vote was taken in the Senate, the independents had lost by 40 to 34. At the instigation of W. B. Heyburn, Senator from Idaho, the Senate adopted an amendment to the tariff bill placing a duty of 6c. per pound on monazite sand and thorite. Another amendment, prepared by the same Senator, was adopted as follows: Thorium, oxide of and salts of, 60% ad valorem. Gas mantle scrap, consisting in chief value of metallic oxides, 20% ad valorem. Thorium, it was explained to the Senate, is used in the manufacture of incandescent gas mantles and is extracted by chemical process from monazite sand. This sand is found in commercial quantities in Brazil and the United States, a German concern controlling the industry in the former place. Importers and mantle manufacturers offered their protest to the Senate against the imposition of a duty on the sand. This brought out a reply from Alexander P. White, vice-president of the National Light & Thorium Co., which to a degree was startling. Mr. White, under oath, charged that the German concern lowered the price of thorium from \$6 per pound in 1905 to \$3.50, with the purpose of injuring the American company. This caused the company to suspend business, and then the price went up to \$4.80, at which price it remained until the publication of the Payne tariff bill. Thereupon the price was again reduced and the material sold at prices varying from \$3.40 to \$3.70, which is less than the cost of production in the United States. Robert J. Gamble, Senator from South Dakota, introduced an amendment providing for a tariff upon cassiterite, and upon bar, block, and pig tin, a duty of 4c. per pound when the mines of the United States are producing, and will continue to produce 1500 tons of tin in cassiterite or of pig tin per year.

MEXICO.

Guanajuato. — Gold Increase with Depth. — La Pastita. — New Construction. — Real Del Monte Dividends. — Revival at Zacatecas.

The combined bullion, concentrate, and rich ore production of Guanajuato continues gradually to increase, until it is now some twenty thousand in excess of the quarter million peso mark per week, and there is also a marked increase in the gold content of these shipments. There seems to be a slight increase in gold in the ores as deeper working is attained, though the largest gold yield is obtained from the new producers and from those on the outer edge of the district where the cross-vein system is strongest. The Carmen, Pinguico, and Peregrina are included in the list. This latter, being one of the Guanajuato Development Co.'s properties, is treating at its new mill with great success from 14,000 to 15,000 tons per month. Some 11,000 tons of this comes from the mine and the remainder from the dumps. The resulting bullion has about 70% of its value in gold. The Peregrina is showing better than ever. The Guanajuato Consolidated Mining & Milling Co. has now 100 stamps dropping at its San Francisco mill in La Pastita, and with the filter-press just completed will be enabled to greatly increase its tonnage. This company showed for 1908 a surplus of \$32,080 above its regular dividends, and its annual report stated that \$68,495 was paid to the Federal Government in taxes of various kinds. At El Cubo mine, one of the farthest outlying properties, which has been all but closed for some time because of expensive handling and unsatisfactory extraction, the tunnel has been completed and surface trams are being installed to run direct from the tunnel to the mill and new cyanide tanks. On completion of these, production and extraction will be again resumed, when it is believed that the economy of tunnel, and alterations in the cyanide plant, may put this old property once more on a paying basis. The San Cayetano is being rapidly unwatered by the Lewisohns and will soon be placed among the shippers. The Santa Natalia new 100-ton mill is up and working and is giving excellent returns. The new mill is rapidly nearing completion on the Carmen. At the properties of the American Mining & Milling Co., at the Corwin & Greene group, at the Robles mine, and at the Letitia M., there is promise of early and large production. George W. Bryant, of the Guanajuato Development Co. is planning a great deal of new work in La Luz district before the end of the year. Norman Rowe, of the Guanajuato Electric Light & Power Co., is stringing his wires as rapidly as possible in all directions. He has but just completed the line into San Gregorio, and is giving light and power to Silao. One cannot help marveling at the changes which have been wrought at Guanajuato in the last few years. The rejuvenation of Guanajuato is almost wholly due to the introduction of American capital, the cyanide process, and electricity. The same applies to Pachuca, recent manifestations of the results of which are the dividend just paid by the Real del Monte Co., of Pachuca, of \$100 per share on 2554 shares, making \$870,000 paid by that company in dividends this year. Seeing what had been done in the old camps of Guanajuato and Pachuca, and knowing the immense low-grade deposits in the famous old camp of Zacatecas, one could not help prophesying that Zacatecas must soon follow in the footsteps of the other two. The rather complex character of the Zacatecas ores, however, from a clean quartz to a heavy sulphide, and the belief that the cyanide method was limited in its application, delayed the change in Zacatecas. The El Bote mine, one of the oldest producing properties in the district, with its new mill has blazed the trail for the cyanide treatment at that place. Awakened by the results at El Bote, a number of prominent business men of Zacatecas, under the guidance of Marcelino Velasco Peña, have organized a company and subscribed for the erection of a modern and complete testing plant, wherein may be conducted experiments on all the various ores of the camp on a working scale. It will not be a custom mill, but a testing plant on a large scale, for the benefit of the whole camp. The erection and completion of this plant means much to Zacatecas. The general impression is that on the clean dry ores economical results may be ob-

tained on as low a grade as 350 grams (10 oz.) per ton, or even lower. Of such ores there are thousands of tons on the dumps and in the old mine workings. With the success of these experiments there lacks only the introduction of electricity to make Zacatecas great.

BUTTE, MONTANA.

June Production. — Amalgamated Management. — Flathead Placers. — Polaris. — Bear Gulch. — Princeton District.

The monthly copper production of the Butte companies for June reached about 25,548,880 lb., with operations averaging 28 days during the month. The total average daily production was 912,460 lb., and the tons of ore mined during the month amounted to 352,100. The returns for the various companies are given below:

| Companies. | Daily Lb. per | | Total lb. |
|---------------------------|---------------|------|------------|
| | tons. | ton. | |
| Boston & Montana | 3,510 | 75 | 7,371,000 |
| Anaconda | 3,530 | 65 | 6,424,600 |
| Butte & Boston | 630 | 63 | 1,391,320 |
| Washoe | 530 | 61 | 905,240 |
| Parrot | 390 | 58 | 633,360 |
| Trenton | 400 | 59 | 660,800 |
| North Butte | 1,325 | 90 | 3,339,000 |
| Butte Coalition | 1,310 | 77 | 2,824,360 |
| Original | 550 | 76 | 1,170,400 |
| Pittsburg & Montana | 300 | 72 | 604,800 |
| Miscellaneous | 100 | 80 | 224,000 |
| Totals | 12,575 | | 25,548,880 |

John D. Ryan, who is in Butte this week, states that the management of the Amalgamated properties will proceed in the future much as they have in the past. Mr. Ryan also stated that Ben B. Thayer, the newly elected president of the Anaconda Copper Co., will continue to visit the city.

A. J. Davis, Charles J. Kelly, and Mel Lowery have become interested in placer gold mining in Flathead county. Harry Armstead, Jr., of New York, manager of the Silver Fissure Mining Co., which owns a mine and smelter at Polaris, Montana, visited the company's property last week. A spur is to be constructed from the nearest point on the new Gilmore & Pittsburg railroad, on Horse Prairie, to Polaris, and in consequence it is anticipated that the camp will experience a boom within the next few months. The Bear Gulch district of Madison county is the scene of much activity this summer. It is rich in lead and copper, and it was here that one of the first efforts at lead smelting in Montana was made. A consolidation of properties, in which Alex Johnson and the Moffat brothers are interested, is said to be impending. Several experts have visited the ground this summer and made examinations. In the same district Bert A. Tower and Bert Plum have erected a small cyanide mill on what is known as the old Bausch property, and are mining and treating the ore. The Stewart boys of Butte have a lease and bond on a property in the same gulch, and in a 300-ft. adit have cut a vein 30 ft. wide, 10 ft. of which is good shipping ore and 10 concentrating ore. They are now improving the old concentrator on the property by the addition of Wilfley tables, and will also put in an air-compressor.

In the Princeton district of Granite county, 60 miles west of Butte, some important work is being done. On the Gold Hill property, owned by a number of Butte men and bonded to a man named Bradley, a vein of free-milling gold ore assaying \$12 to \$15 per ton has been found. In the same district and on the South Boulder creek, the old Brooklyn mine has been shipping ore during all of the past winter. It is an old-time silver-lead producer, and is owned by Whitworth, Garron, and New, of Phillipsburg. Three shoots of ore, 35 ft. thick and of indefinite length, have been discovered, and a winze is now being sunk on ore which will average 1000 oz. silver per ton. The Northern Belle, near Princeton, is being opened for a syndicate of Seattle men, but the work is somewhat delayed by water. Arrangements are being made for the construction of a mill. All of these properties in the Princeton district are in the vicinity of the once famous Granite Mountain and Bimetallic properties.

JOHANNESBURG, TRANSVAAL.

Simmer Deep Mill.—Caldecott Filter Tables.—Mineral Output.

On May 22 the members of the Chemical, Metallurgical & Mining Society visited the plant of the Simmer Deep, a mine as well known for the excellence of its milling and cyanide works as for the lamentable poverty of its ore reserves. The percentage of unpayable rock developed is apparently such that the directors have not the courage to make a clear statement as to the full results of development. But what the Consolidated Gold Fields lack in this connection is well compensated for by the very high efficiency of their metallurgical and mechanical departments. The Simmer Deep and Jupiter joint mill of 300 heads has given W. A. Caldecott and Hans Behr an opportunity of putting into practice the latest ideas in the construction and operation of reduction plants, without obstruction by existing units or by limitations of space. The mill, which is at present of 300 heads, involves many new features. The mortar-boxes rest on cement foundations, with a $\frac{3}{8}$ -in. rubber cushion and no anvil block. Stamps are weighted up to 1650 to 1700 lb., and each battery of 10 stamps is driven by an independent 50-hp. motor. The mill-bins are flat-bottomed and of 7000 tons capacity, and the ore is fed into the mortar-boxes by means of 'Nelson' grip feeders. There is back-water feed. In the construction of the battery and mill building an exceptional amount of iron and steel is used. In the original design of the plant, which has been laid out with special attention to the requirements of speedy extension, the classification of the mill tailing for the tube-mill circuit, sand and slime plant was to have been effected in the usual spitzluten. Changes have been made at this stage of the process, and these prove the most interesting feature of the plant. The mill-pulp is elevated by Morris pumps to a set of 12 conical classifiers, fitted with diaphragm plates near the outlet to prevent the formation of sand channels. These provide an overflow running off to the slime plant and an underflow, delivered to another set of eight diaphragm cones, which yield a further contribution to the slime plant. The underflow product of these last cones is delivered to a new type of rotary filter table, introduced by Mr. Caldecott, which removes practically all remaining slime and water, and yields a good leaching product of sand. Though unable at present to give details of this innovation, it may be stated that it comprises a table 20 ft. diam., with an outside filter ring 30 in. wide. The filtering medium is the usual cocoanut matting, upon which, however, a permanent bed of sand, $1\frac{1}{2}$ in. deep, is left by the inclined scraper-blade which turns the dewatered sand (60% of the mill-pulp) into the launder delivering to the pumps. Below the table there are six radial pipes applying a 3-in. vacuum, which draw off the slime and water. The tables (two are in use, easily serving the mill of 65,000 tons capacity) are rotated at 3 revolutions per minute, and have a normal working capacity of about 1000 tons of dry sand per diem. The sand product from the tables is washed down the launders with a 0.3% cyanide solution, and by the time it reaches the collector yats (which are also served by vacuum air-pumps, to facilitate the later stages of leaching), 50% of the gold is dissolved. From the collectors the sand is transferred by belt conveyors to the secondary treatment vats. Owing to the early introduction of the cyanide solution and the agitation the sand undergoes in its association, time of treatment is greatly reduced. Before the mill-pulp is delivered to the first set of cone-classifiers, the concentrate or tube-mill product has been eliminated by means of spitz-boxes and ordinary conical dewaterers. This scheme has been improved upon at the neighboring Simmer & Jack mine, where the heavy sand for the tube-mills is separated out in a single operation. Large conical classifiers with the diaphragm to ensure a steady thick underflow are here employed with great success.

The Transvaal's output of minerals and metals other than gold, coal, and diamonds reached a record height in April at the small total value of £36,356. The lesser industries are indeed developing slowly. This total is made up of the following principal items: tin ore, 257 tons,

valued at £21,228; copper ore, 165 tons, at £4345; and galena, 162 tons, at £1594. The remainder consists of lime, flint, magnesite, asbestos, graphite, and blende.

The schemes on foot for the establishment of large central electric-power stations have prompted the Government to appoint a commission to enquire into the probable influence of such power-supply companies on (a) the Rand gold industry, (b) the coal industry, (c) the Central South African Railways—which are under Government administration, (d) agriculture and irrigation, (e) any other industries or trades, (f) the employment of labor, and (g) the country generally. It is also proposed to ascertain what facilities should be conferred upon the companies of the State, what restrictions should be imposed upon them, and what powers of expropriation should be reserved. The evidence already given has been of great interest. Hans Behr made out a strong case in favor of electric power for all departments of mine-work, on account of the economy in capital and running costs, and the greater flexibility of the system. There are already two central generating stations on the Rand, at Brakpan and Simmerpan, and Mr. Behr advocated the erection of two new plants, one on the Rand and the other at Vereeniging, near great coal and water supplies. Mr. Spengler, chief engineer for the Vic-



Sand Filter Table at Simmer Deep.

toria Falls Power Co., presented remarkable figures in support of the view that the coal consumption in the future will nevertheless increase, owing to greater activity on the Rand. He estimates that about 27,000,000 tons of ore will be the Rand's annual crushing capacity in 1911, and judging by present arrangements for the partial or complete electrification of certain mines, the coal consumption will be 2,430,000 tons or 305,000 tons in excess of the figure for 1908. It may be mentioned that while the present cost of purchased power is 1.50c. per kw.-hr., it will eventually be reduced to 1.05 cents.

Although the Commission of Enquiry has only now commenced its investigations and is still far from issuing its verdict, the Het Volk or Boer party has already frantically expressed its opposition to the establishment of these central power stations. The scheme "would work havoc on the farming industry," "would endanger the prosperity of many districts," "would rob the owners of High Veld coal-farms," "would impoverish thousands for the sake of a few," "would throng the streets with unemployed," and it involved the granting of an "infamous concession." It is unfortunate that such expressions should be uttered before the facts have been made known. It is certain that central power stations will, or should, play an important part in the prosperous development of the Rand industry, and the Government now possesses a more direct and weighty interest in gold mining than hitherto, owing to the speedy utilization of water-rights and bewaarplaatsen (depositing sites) for which the mining rights are vested in the Crown. The demands of progress do not permit of the unnatural fostering of coal mines at the expense of the premier industry. The 'Backveld Dutchmen' are notoriously conservative in their ideas.

SALT LAKE, UTAH.

Boston Con. Mill. — Copper Output. — Grand Central Strike. — Ohio Copper. — International Smelter.

The Boston Consolidated mill has now been running at full capacity since the evening of July 3. The thirteenth and last section was completed several days ago. The mill has a normal capacity of 2700 tons, but A. J. Bettles says that they have demonstrated the practicability of treating more than 3000 tons in 24 hours. The saving averages close to 80%, which is the best performance of any of the Utah concentrating plants. With the Garfield mill of the Boston Consolidated running at full capacity, it is estimated that the company is making its copper at a cost approximating 9c. per pound. From this it is concluded that the total net monthly profit is about \$100,000. The company is the second largest copper producer in Utah, and in addition to the high recovery from its porphyry concentrate, its sulphide mine will soon be increasing its output. The total output of copper from Utah for the month of June is estimated at more than 10,000,000 pounds.

One of the most important pieces of work in the Tintic district during the year is reported by officials of the Grand Central mine. A prospect drift was driven 100 ft. to the west from the 2000-ft. level, and a fine body of copper and gold-bearing ore was opened. From the 1800-ft. another level has been started to the west to tap the same orebody. Later a third drift will be extended from the 2100-ft. level. It is believed that the new orebody is the Centennial-Eureka vein. If this be true, it will mean that the Grand Central has practically a new mine. It has already paid in dividends about \$1,500,000.

Colin McIntosh, general manager of the Ohio Copper Co., has been East. He says that the entire bond issue of the company has been sold, and that ample capital is at the disposal of the management. The first unit of the mill will be completed and commissioned within a few weeks. The remaining sections will be put in running order as quickly as the machinery can be installed. Arrangements for the smelting of concentrate have been made with the Garfield Smelting Co. This company will market its own product through the Heinze ore-selling agency in New York. The mine force is to be increased, and extensive development conducted on levels 3, 5, and 7. The Mascotte tunnel has been completed to the end-lines of the Utah Copper.

Structural steel is being delivered at the International Smelting plant in Pine canyon. Foundations for the machine-shops and power-house have been completed, and structural-iron workers are now engaged in erecting the steel. The railroad and steel manufacturers have agreed to deliver the material as fast as the smelting company needs it. Good progress has been made in the erection of the plant.

TERLINGUA, TEXAS.

Renewed Activity. — Gaines Lands. — Boquillas Mines at Marathon.

The quicksilver output of the cinnabar mines in the Terlingua district, situated about 90 miles south of Alpine, is being greatly increased by the renewal of development. The Texas Almaden mine, which is owned by Sanger Brothers, of Dallas, Texas, has entered upon a period of production after a shut-down of more than a year, due to the flooded condition of the lower workings. It is stated that the water is now under control and that the output of the mine promises to be very large. According to report, more than \$300,000 have already been expended in development upon this property. The Chisos Mining Co. is preparing to operate its mine upon a more extensive scale than ever before. This property has a record of bringing to its owners a net profit of about \$15,000 per month for several years. A 40-ton furnace was installed about a year ago. The workings extend to a depth of more than 400 ft., and the ore increases in richness with depth. The fact that the Terlingua district is 90 miles from the nearest railroad point and that the trip to the remote locality is full of discomforts has retarded the quicksilver development there very much. Another disadvantage is that every alternate section of land in

the district is owned by the State of Texas. In the absence of an adequate mining law there has been very little prospecting done upon these State lands, although many of them are believed to be rich in cinnabar ore, and probably other precious minerals. It is announced that William P. Gaines, of Austin, Texas, who controls about 128,000 acres situated in and close to the proved quicksilver district, has organized a strong company for the purpose of developing the minerals. Outcroppings of rich cinnabar ore have been found.

Americans have done some prospecting for cinnabar on the Mexican side of the Rio Grande, and it is stated that a number of promising claims have been opened, but the lack of transportation facilities has so far prevented much development work being done upon them. Marathon, a town situated 25 miles east of Alpine on the Southern Pacific railroad, is to be made a shipping point for the ores from the rich Boquillas mines which are owned by Carlos Moser. These mines are situated close to the Rio Grande, but across the river in Mexico, and are 100 miles from Marathon. Mr. Moser is now installing an aerial tram six miles long, to convey the ores across the river from the mines. From the end of the tram on the Texas side of the river the ore will be hauled to Marathon in wagons, drawn by traction engines. Mr. Moser has built a good wagon-road to connect the mines and Marathon. The mines are large producers of silver-lead and of zinc ore. More than 70,000 tons of ore are now upon the dump.

COBALT, ONTARIO.

Beaver Con. — Lawson. — Coniagas. — Silver Cliff. — South Lorrain.

The ore-shoot in which high-grade ore was first found on the Beaver Consolidated mine in South Coleman has recently become productive again. It was struck at 180 ft. from the main cross-cut; for 40 ft. it was barren, but at this point the ore occurs in a vein about 6 in. wide bearing 2000-oz. ore. The power-house, which was burnt down, is being re-built, and the compressor and plant should be running again by the middle of July. Ore is only found in this vicinity a hundred feet below the surface and all properties in the neighborhood are sinking. The Ophir has just put in a plant. It consists of a 100-hp. boiler, a 6-drill Sullivan compressor, and two pumps. For the John Black, a neighboring property, a small compressor and an 80-hp. boiler has been ordered. The Lawson property of the La Rose Consolidated group has struck another high-grade vein. It runs at right angles to the richest vein in the camp and was found as a mere stringer in a cross trench. At the bottom of a small test pit it is 18 in. wide, and shows little but smaltite and silver. Two assays gave just short of 1000 oz. per ton. The company is getting air from another of its properties, the University, but foundations are being laid for a boiler and ore-houses. The Coniagas mill will be enlarged to double its present capacity. The mill now treats 80 tons per day and there are 30 stamps. Thirty more stamps and extra concentrating tables will be added, so that 160 tons can be milled per day. It is expected that the enlargement will cost \$40,000 and will be completed in four months. The output of the mine will then be six cars of high-grade ore per month.

Pittsburg capitalists interested in the Carnegie Steel Co. have bought the Silver Cliff property on Cross lake for \$75,000. W. H. Jeffery, who negotiated the deal, is general manager and is pushing development. There are many rich narrow veins and the country rock for several feet shows silver leaf. The two producing mines of the South Lorrain camp on Lake Temiskaming have recently installed plants. The Wettlaufer, a Buffalo company, now has running an Ingersoll-Sergeant compressor of 5-drill capacity, driven by two 60-hp. boilers. They have one car of high-grade ore and two cars of low ready to ship. The ore taken from the 65-ft. shaft will pay for the whole plant. The Keeley has in place two Crossley gas engines, one of 150 hp., and the other of 65. A 40-kw. generator will run the hoists, the pumps, and supply the light for the camp. A Canadian Rand air-compressor will supply power to run the drills. All the plant, with the exception of the compressor, was imported from England.

GOLDFIELD, NEVADA.

Consolidated Reduces Earnings.—Diamondfield Discoveries.—Western Smelters Plant at Carson City.

An official statement has been made by A. H. Howe, secretary and treasurer of the Goldfield Consolidated, embodying estimates of the gold production in June and explaining a change in the policy of the company. While the new policy will lessen monthly net earnings, it will, through the mining of ore of the lowest profitable grade concurrently with the high and medium grade, increase final profits. In outlining this policy Mr. Howe said: "All the ore in our stopes having a value sufficient to afford a profit in treatment will henceforth be stoped at the same time the higher grade ore is taken out, irrespective of the relation such values may have to any fixed and arbitrary basis of earnings. While this policy results in a considerable reduction in the value of the ore milled, and a consequent lessening of monthly revenues, it follows that its effect will be to save ore which would either be lost or which would later involve additional expense to produce. It is deemed wise to accomplish the production of this ore under an original rather than a secondary mining expense. That this policy will materially enlarge the productive capacity of the property and greatly lengthen its life must be apparent to the most casual observer. Continuous production such as we announce for June will serve to pay operating expenses, and at the same time maintain dividends at the established rate of 30c. per share quarterly, and we believe for a longer time than by leaving the low-grade ore for future production. Our estimated production for the month of June is as follows: Tons produced, 19,410; estimated net recovery, \$547,000; estimated total cost of production, \$150,000; estimated net profit, \$397,000. The relatively small tonnage was caused by a shortage of electric power, lasting for five days and due to the recent wash-out."

In spite of the heavy falling off in profits, there is nothing of a startling nature in this announcement, as the policy was outlined by the general manager before the 600-ton mill was completed. During the early months of operating this mill, and while the known orebodies were being opened on an extensive scale, it was necessary to mine and treat much ore of higher grade than that from which the best results in reduction are obtained. At no time has it been the intention to neglect the lower grade ore, nor has it been expected that the mills of the company would continue permanently to treat \$40 ore, as this would have entailed leaving in the workings a vast tonnage of low-grade. Shortage of power has kept the mills of the district idle for several days, but the July production of the Consolidated company will probably exceed that for June, although at present no high-grade ore is being shipped. The belief expressed in some quarters, that the new policy is due to a shortage of the better class of ore in the mines, is ridiculed by men acquainted with the workings. It is common knowledge that many headings are bulkheaded with heavy timbers to protect the high-grade ore.

Two recent ore discoveries in the neighborhood of Diamondfield, in the northeast portion of the Goldfield district, in and near the Golden Daisy lease, are attracting attention. Some rich samples have been secured in the old Detch-Brewer workings, which are being operated by Bruce Jones and Guy Millard. A short distance north of the Daisy an ore-shoot has been opened at a depth of 65 ft. on the Goldfield Belmont and on the extension of what is known as the Graham vein.

Owing to the decision rendered some months ago requiring company meetings of Arizona corporations to be held in that Territory, many Nevada companies are re-incorporating in this State. Among these is the Western Smelters Corporation. The president, J. A. Yerington, of Carson City, is now at Phoenix, Arizona, seeking dissolution of the concern for the purpose above stated. This company is building a 250-ton copper smelter about five miles east of Carson City. The plant will be in operation by the end of this year. The ores available from the company's mines carry such a large excess of iron that a local market will be created for the silicious Goldfield ores.

BRITISH COLUMBIA.

Rossland Mines.—New Dominion Copper.—Coal Mines Resume.—Salmo District.—Highland Valley.—Mineral Output.

The strike made some days ago on the Blue Bird property in the South Belt at Rossland has developed better than was at first anticipated. The lessees have taken out about 30 tons of galena ore which is expected to yield \$80 per ton. Three shifts of miners will be put at work. The company will take the property over as soon as the present lease expires. The shaft on the Hattie Brown, in the South Belt, has reached a depth of 70 ft., the vein at this point assaying about \$49 and being 6 ft. in width. Cross-cutting on the surface of this property is giving very good results. A meeting of the board of directors of the B. C. Mining & Development Syndicate was held during the past week, G. A. Ullerick, president of the company, being present. Work at the Le Roi No. 2, Ltd., goes on as usual with good results, and the confirmed reports of the operations for May show that 2168 tons of first-class ore was shipped, for which the smelter receipts amounted to \$48,549, a fraction over \$22 per ton, which is the average value of the first-class ore shipped by this property. Eighty-two tons of concentrate was also sent to the Trall smelter, from which the returns were \$41.44 per ton. The fixed charges at the Le Roi No. 2, Ltd., are not very heavy, as they maintain no large power-plant.

Among the newly registered mining companies in this Province appears the name of the New Dominion Copper Co., capital \$1,000,000, in shares of \$5 each; also the Argo Mining & Tunnel Co., capital \$125,000, in 25c. shares. The first indicates that the work of getting the affairs of the New Dominion Copper Co. in form is going forward. The Argo Mining Co. is driving an adit into the hill at Greenwood, some distance south of the adit of the Phoenix-Greenwood property. The tunnel on the E. P. U. claim, near Greenwood, is now in about 1300 ft., being the result of work done by a local syndicate during the past couple of years. According to the calculations of the operators, the vein should be reached at an early date.

J. S. Airheart, of New York, is in Nelson, arranging for the resumption of work at the Highland mine and mill, which H. N. Roach & Co., with whom he is associated, recently acquired.

The mining situation in this district will be much relieved by the action of the coal miners in Southern Alberta in signing the Macleod agreement, thus settling all labor trouble in the coal fields. Work will be resumed at many of the mines immediately. The resumption at Coleman will give a supply of coke to the British Columbia Copper Co. which will start up its mines and smelter as soon as the fuel bins are full. A big body of ore was opened up in the St. Eugene mine, Moyle, last week. This property, which is controlled by the Consolidated Co., shipped 807 tons of high-grade product to its smelter at Trall during the week ending June 26. A new adit has been started on the Aurora property, across the lake from the St. Eugene. This will be 150 ft. above the lake and the same distance below the main level. Mining affairs are particularly lively in the Salmo district this season. A new strike has been made on the Clyde group of five claims, the vein on the surface showing the same characteristics as the Queen, Mother Lode, and other prominent adjacent properties.

A vein nearly 300 ft. wide, that carries \$26 to \$258 per ton in gold, has been found near Lillooet lake. The find was made by an Indian, and many locations have been made in the neighborhood. There is active development in Highland Valley district. Work is now going on at the Twenty-Four, Ball group, Topnotch, Tamarac, I. X. L., and other claims. Several deals are pending with New York and Butte capitalists. The mineral product of this Province for the year 1908 is valued at \$23,851,277, according to the figures of the Provincial Minister of Mines, whose report is just off the press. This was somewhat under the figures for 1907, although the tonnage was greater by 279,492 tons. The Boundary-Phoenix and Rossland districts maintain their positions of prominence, having accounted for 71.6 and 14.5% of the total output, respectively. The total tonnage mined, exclusive of coal, was 2,083,606 tons.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Selenium is recovered from the slime resulting from electrolytic copper refining. It sells for approximately \$2 per pound.

Manganese steel may easily be 'burned', and thus lose its valuable properties, if heated for quenching above 1000° C. Such heating is also liable to develop deep cracks in the metal.

Copper ore at the United Verde mine, in Arizona, does not exist in a vein of great longitudinal extent. It is described as being essentially a 'pipe', or ore-shoot, approximately 200 by 2000 ft. in horizontal section, but persistent in depth.

Slate, according to ordinary usage, denotes a rock which has more or less perfect cleavage, adapting it to various commercial uses, and in which the constituent particles, with few exceptions, can not be distinguished except in thin sections under the microscope.

Metal prices vary with many conditions. The 'normal price' is the average price over a long term of years. The 'basic price' is that which marks insufficient production and the turning point toward a rise. Both must be considered in estimating future prices.

Exhaustion at some depth is the fate of all mines. Of several hundred dividend-paying metal mines studied, not 6%, outside the Rand, yielded profits from ore won at more than 2000 ft. in depth. Not 20% yielded profits below 1500, and a majority paid their dividends from ore won at depths of less than 500 feet.

Lignite in the Magellan archipelago, in Chile, occurs in rocks of Tertiary age, which are a continuation of the deposits found in the Argentine pampas. The crystalline rocks of these islands consist chiefly of granite and mica schists; the eruptives consist chiefly of trachytes, with more recent gabbros and dolerites.

Pacing may be done easily and with an average error not exceeding 2% on level ground and 10 on the roughest. In pacing it is well to use a step slightly longer than ordinary. With most men 1000 to 1100 double paces may be counted a mile, but each should accurately determine his own pace by repeated trial before beginning work.

Hammers for geological work should weigh one to one and a quarter pounds, without the handle. Chisel points are to be preferred for work on soft rocks where digging must be done, as on a coal outcrop. Only the best steel should be used, tempered so it will not chip. Trimming hammers for museum work are best square-faced, and should weigh about six ounces.

For desert travel horses should be picked, where possible, which are used to the work, as others fret on sandy roads and rapidly weaken from drinking

saline water. They are also in danger from pneumonia from the cold of winter nights and the wide extremes of temperature. During winter journeys blankets should be provided to protect the animals at night.

Copper subjected to mechanical strain may be restored to its former ductility by annealing. Hard copper, which can be extended only 45 to 53% of its length, may by annealing have its ductility so increased as to admit of an extension of 120%. Heating copper to a bright red for any considerable time also destroys its ductility, which, however, can also be restored by annealing.

Briquetted or 'agglomerated' fuel is made by pressing in molds a mixture of coal dust and small sized pieces of coal or other carbonaceous material, together with a binding substance. The most common binder at present commercially available is a pitch, made either from coal tar or water-gas tar, but other substances, such as starch, lime, and sulphate liquor, have been used. The mixture of coal and binder is heated and subjected to heavy pressure in molds.

Pitch is the angle made by an ore-shoot in the plane of a vein, and is measured from the horizontal. This term should be held distinct from dip, which is the angle of the axis of inclination of a vein or stratum measured from the horizontal. Thus a vein may have a dip only; an ore-shoot in a vein will participate in the dip of the vein and possess its own angle of pitch. Striae, scorings, or slickensides in a vein, as well as rift, may have an inclination different from the dip; to this the term pitch may be applied.

Secondary impoverishment is the humorous antithesis to secondary enrichment of veins, proposed by Henry Hobart Knox. He cites deposits near Ekaterinburg, in the Ural mountains, Russia, where a gossan is followed by a barite zone, succeeded by an auriferous pyrite zone, which in turn is underlaid by a cupriferous pyrite zone. This is a normal succession, the leaching here observed being particularly characteristic of veins in the arid regions of the western United States. In the case described by Mr. Knox, removal of the sulphides by leaching caused squeezing of the vein by the pressure of the hanging wall so that it had been reduced to less than one-third its normal size as revealed lower down.

Smokeless combustion is possible with many types of furnace. The stoker and the furnace must be so built that combustion will be complete before the gases strike the heating-surface of the boiler. When partly burned gases at furnace temperatures near 2500° F. strike the tubes of a boiler that are perhaps at 350° F., combustion is necessarily hindered, and may be entirely arrested. The length of time required for the gases to pass from the coal to the heating surface probably averages less than a second, and the gases must be intimately mixed to insure complete combustion. Mechanical stokers are to be preferred, for the reason that the regularity of their feed tends to insure uniform distillation of gas and avoids its sudden generation in large volume that the air present is insufficient to consume.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Protection of Investors.

The Editor:

Sir—In a letter concerning the 'Protection of Investors', in which F. J. H. Merrill calls special attention to the need for the protection of those who invest in prospects, I find myself obliged to disagree, either with his statement as to the mortality among prospects, or to change my idea as to the proper definition of the word 'prospect'. Mr. Merrill states that "The mortality among prospects is probably no greater than among children, and failures in mining are no greater than in ordinary business pursuits, where only 2% achieve success." The old English mortality tables compiled by Farr show that 30% of all male children die under the age of five. Beyond this age the mortality of children is low, rather less than 1% per year. The American tables give slightly lower results, and within the past 15 years increasing knowledge and care have further decreased the figures. Undoubtedly far more than 50% of the children born reach the age of 21. Now, if my idea as to what constitutes a prospect is correct, nothing like this percentage ever become successful mines. I believe the old-time prospector would consider the same showing worthy of the name 'prospect' which the Utah judge ruled as constituting a valid location. The ruling is that "A valid location of a mining claim may be made whenever the prospector has discovered indications of mineral." Possibly this is an extreme view, but it appears to be borne out by the Century Dictionary, which defines a prospect as: "In mining, any appearance, especially a surface appearance, which seems to indicate a chance for successful mining." If we accept these definitions, which do not appear to even require that a pick shall have been stuck into the ground, the number of prospects which fail to become mines drifts off toward infinity. If, however, we consider as 'prospects' only those openings in the ground actually showing quartz or other rocks and minerals which commonly contain valuable metals, I still believe the number of prospects which become paying mines will fall far below the 2% referred to. Gifford Pinchot considers that a prospect ceases to be such when it begins to produce. In his letter to the Forestry Committee of the Mining Congress, published in the MINING AND SCIENTIFIC PRESS for May 29, 1909, he says that men should have free use of timber from the forests on any claim, "so long as it is a prospect and not a producing mine. When a prospect becomes a mine and begins to produce ore, it is then a commercial enterprise." This distinction will not, however, serve in considering the protection of investors, since a mine producing, or shipping, ore is not necessarily a paying mine. To be a producer, from the standpoint of the investor, it must pay a dividend. Unless it returns the capital invested, with reasonable interest,

it is not a paying mine. But one need only look at the thousands of prospects within ten miles of Cripple Creek or Goldfield, or visit Greenwater, to feel confident that far less than 1% of the prospects become paying mines. In 1892 I was told that there were over 1200 claims located in the New World Mining District, in Montana. Most of these were probably worthy of the name of 'prospect'. I doubt if one of them has become a paying mine, as above defined, though the advent of a railroad might change many of them into producers. There are many other portions of the country where similar conditions exist. On the contrary, there are districts with a relatively large proportion of paying mines. Anaconda Hill, Bingham, or Gilpin county, are examples. Yet these are surrounded with zones of non-productive holes, some with promising indications.

The terms 'prospect', 'mine', 'producing mine', and 'paying mine' are, like many others in common use, not easy of accurate definition. But I can conceive of no acceptable definition of the word 'prospect' which would admit of the statement that "the mortality among prospects is no greater than among children." And it is such statements as these, made by reputable professional men, that the promoter seizes with avidity for the adornment of the prospectus which catches the identical class of investors that Mr. Merrill wishes to protect.

GEO. A. PACKARD.

Boston, June 15.

Legislation Regarding Oil Lands.

The Editor:

Sir—Having carefully studied the bill introduced in the House at Washington by S. C. Smith of California, "To provide for the disposal of lands chiefly valuable for oil and asphaltum," I should like, in the interest of the oil industry of California, to offer some remarks on the subject. The main object of this bill is to repeal the Act of 1897, whereby the entry and patenting of land containing petroleum and other mineral oils was placed under the placer mining laws of the United States. This object will undoubtedly meet with general approval; I do not think that anyone interested in the legitimate development of the oil industry desires to have this regulation kept on the statutes any longer than can be helped. There are, however, some clauses in the bill offered by Mr. Smith which, it appears to me, will tend to prevent legitimate development of such lands as are only of prospective value. It is provided in this Act (Sec. 2) that no claim exceeding 160 acres can be claimed by one person, and besides that, such claimant is not entitled to such a claim if he has previously claimed any land in the same county under the provisions of this Act. I consider this clause unjust to the oil industry. The drilling of a well in an undeveloped country is a hazardous and a costly undertaking. It may cost all the way from \$20,000 to \$60,000, with no assurance that the ultimate result will repay the investment. To prevent a person who has spent his money in such an undertaking from getting more than 160 acres, in case his efforts are crowned with success, appears to me to be unjust. The result of his investment will make the land di-

rectly contiguous to that on which he has spent his money, just as valuable as his own claim, and it appears to me only just that he should have a preference in realizing that increment of value. In case, however, that his efforts prove fruitless, it seems to me rank injustice that he should be prohibited from trying again in the same county in which his first attempt was made. Why a man should be restricted in his rights because he has spent his time and money in trying to develop the public lands of the United States is to me incomprehensible. In Sec. 3 it is stated, "No individual or corporation shall be a party to final proof proceedings under this Act on more than one claim." I am satisfied that this clause will seriously interfere with the expansion of the oil field. I realize the general trend of public opinion against large holdings of property, but in this case it must be considered that the development of oil land demands capital, and it will certainly not take hold of any such a risky undertaking as drilling for oil in an undeveloped country when its chances of remuneration, in case of success, are so restricted. In describing the conditions under which patents may be obtained for an oil claim, should a discovery be made, the following clause is used, "That there has been made such drillings or excavations, on said claim as enables the claimant to produce oil or asphaltum, or both, in commercial quantities." This clause, in my opinion, will give rise to considerable controversy. If I understand the term "commercial quantities" correctly, it means quantities which can be operated with a profit. A well producing 25 bbl. of high-grade oil, situated close to transportation, may be operated at a profit, while a well situated at a great distance from transportation may be valueless even if it produces 100 bbl. of oil per day. The injustice of this clause is flagrant; the man who risks his money in developing territory ahead of the times would be prevented from getting a patent. It seems to me more just to follow the policy used by the Southern Pacific Railroad Co. in giving leases on its land, namely, to stipulate a certain production. Sec. 3 further reads: ". . . if there are any veins or lodes of quartz or other rock in place, bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits known to exist at date of filing such application for patent, title thereto shall not pass under any application, entry, or patent under the provisions of this Act, but are hereby expressly declared to be reserved therefrom, and such vein or lode shall be subject to location and entry by any qualified person or persons under the provisions of the existing United States Mining Laws applicable thereto: Provided, however, that any declarant who discovers any vein or lode bearing asphaltum, gilsonite, elaterite, or other like substances within the limits of the land included in his declaration or entry under this Act shall have the preferential right for a period of 90 days after the discovery of said vein or lode within which to locate same, under the provisions of the general mining laws . . ." It must be noted that no mention is made in this clause of gypsum, the mineral most commonly found in the California oil fields. According to Sec. 2329, Revised Statutes, gypsum may be located as a placer claim, and consequently falls under

the head of "other valuable deposits" mentioned in the above quotation. Is the meaning of this section, that the same land can be covered by an entry for oil and asphaltum under this Act, and simultaneously by a placer claim for gypsum? While this conclusion is apparently an absurdity, yet I do not see how this clause can be otherwise construed.

While I have criticised some clauses in this bill, I am fully convinced that the main object of the bill is correct. I trust that my criticism may open a discussion whereby some improvements may be caused to be made in this bill, which may render it still more beneficial to the oil industry of California.

WM. FORSTNER.

San Francisco, June 17.

The First Rock-Drill.

The Editor:

Sir—Perhaps no piece of machinery has accomplished as much for the world at large, and the mining profession in particular, as the rock-drill, and it seems to me not only right, but important, that we give full credit for its invention and perfection to the man—a brother engineer—to whom it is really due. Recently there appeared in your columns the following: "The first practical rock-drill for hard rock, a pneumatic percussive drill, was designed, not for mining, but for tunneling purposes, by Sommeiller, for the Mont Cenis tunnel; priority of conception seems to belong to an American, Fowle, who patented such a drill in 1851, and an Englishman, Bartlett, in 1855; but the Sommeiller machine, designed in 1857, was the first to be actually used, in 1861; it seems to have been first applied to mining at Moresnet, in Belgium, in 1863." Similar sketches have also appeared elsewhere. I believe them to be incorrect, and that we are doing an injustice to the memory of that great American engineer, General Herman H. Haupt, when we allow them to pass unquestioned.

While yet a lad, pondering upon the fascinations of an engineering life, I was fortunate in being thrown into close contact with General Haupt for a brief space of time; the memory of the charm of his home life, the kindness of his nature, and the rectitude of his spirit, remain with me vividly to this day. It was during this time that I first heard of his work at the Hoosac tunnel, and how the remarkable speed while the tunneling was under his direction had been accomplished by his invention and perfection of the rock-drill; and I recall being told that, after Governor Andrew had wrongfully succeeded in wresting the work from him, he was given a banquet by an engineering society in England as a recognition of his work in tunneling and in the invention of the rock-drill.

This is a boy's recollection of twenty years ago. Let us see if it can be verified. In 'Reminiscences of General Herman Haupt', written by himself, appears on page 28, among 'notes and a personal sketch by Frank A. Flower', the following: "At the time of the suspension of tunnel work in 1861, Mr. Haupt had made great progress in rock-drilling machinery, and had developed a machine that was far in advance of the perforator at work in the Mont Cenis tunnel at the same time. This drill was improved by a Mr.

Taylor, in the employ of J. A. McKean, who represented Mr. Haupt in Europe and accomplished more rapid progress, at less expense for repair, than any drill used in the St. Gothard tunnel or elsewhere in the Old World; but Haupt never received any royalties or other compensation for its use. Mr. Haupt's knowledge of engineering principles, his great energy and experience, his genius for inventing more efficient rock-drilling and other machinery, and his tact and economy in the management of men . . . would have resulted in completing the tunnel without a cent of cost to the State;" and on the same page is the following: "For some years subsequent to the war, General Haupt followed his profession of consulting engineer in Pennsylvania. In 1867 he visited Europe, upon invitation of the Royal Polytechnic Society of Cornwall, to explain his system of mining and tunneling by power machinery. One of the rock-drills invented by him for use in the Hoosac tunnel, and which was the type of those used in driving through the great St. Gothard tunnel with so much rapidity, was on exhibition and received the highest honors awarded by the society."

The Hoosac tunnel was begun by Mr. Haupt in 1856, and his work there was continuous until 1862. My recollection is that Mr. Haupt perfected his drill one year after beginning work, which would make it in 1857, and give it priority of practical usage, and I believe the claim can be established that he also had priority of conception, although he never, to my knowledge, patented his device. It seems quite certain that, although the Mont Cenis tunnel was completed in 1870, and the St. Gothard not begun until 1872, it was the Haupt form of drill that was the most effective in the latter tunnel, and neither the Sommeiller nor the Mont Cenis form. What the especial characteristics of the several forms of drill were I have no way of knowing, but it would be interesting to have a sketch of them from those who are conversant with the original drills.

S. H. BROCKUNIER.

Wheeling, West Virginia, June 10.

Vein-Continuity on Mining Claims.

The Editor:

Sir—An erroneous impression having gone abroad that the Land Office required proof of continuity of a vein along the entire length of a claim before patent would issue, I beg to submit a copy of the following circular letter from the Interior Department on the subject:

Registers and Receivers,

U. S. Land Offices.

Sirs: The attention of the Department has been called to the last clause of paragraph 41 of the mining regulations, approved March 29, 1909, which provides as follows: "The vein or lode must be fully described, the description to include a statement as to the kind and character of mineral, the extent thereof, whether ore has been extracted and of what amount and value, and such other facts as will support the applicants' allegation that the claim contains a valuable mineral deposit."

It seems that the expression, "the extent thereof," is being construed as meaning that the applicant

must affirmatively show by proof of exploration that the vein exists in fact throughout the whole length of the claim. This construction of the paragraph is erroneous. By the words quoted it was intended to require the claimant to show the existence of a vein in such workings as he relied on to establish a discovery. By the extent of the vein was meant its size and quality as disclosed. That being done, the presumption exists that the vein extends on its strike throughout the whole length of the claim as located. The sole purpose of that part of paragraph 41 quoted was to enable the Land Department to know, so far as applicant can reasonably show, the definite facts upon which the right to the patent is predicated, so as to determine whether a valuable mineral deposit exists in the land claimed. You will give this as wide publicity as possible, furnishing it to such newspapers in your district as may want to publish it or refer to it as a matter of news.

FRED DENNETT.

Approved June 11, 1909.

Commissioner.

R. A. BALLINGER, Secretary.

I hope this will carry comfort to many who may have been disturbed by the dissemination of a wrong understanding of the order.

H. W. M.

San Francisco, June 20.

Cornish Pumps.

The Editor:

Sir—The statements which have appeared in the MINING AND SCIENTIFIC PRESS lately in regard to the superiority of the Cornish pump over direct-acting pumps should not pass without having some light thrown on the other side of the question. In the article in the February 20, '09, issue, by H. F. Collins, their good points are enumerated as: (1) reliability, (2) flexibility, (3) durability, (4) adaptability to sinking. The latter point is well taken, but the three former ones are simply a matter of first cost. If the mine owner should spend half as much money on a direct-acting pump as a Cornish pump would cost, he would be liable to get just as good service out of it.

Mr. Collins says that a Cornish pump which ordinarily runs 1 to 1½ strokes per minute can easily be speeded up to 7 to 8 strokes per minute. This is equivalent to saying that if a pump is required to pump 1000 gal. per minute, one that is capable of pumping 8000 gal. is installed. If this same policy were followed in selecting a direct-acting pump, its life would likewise be prolonged eight times, or, say, to 80 years, repairs would be few and far between, and the rest of the superintendent at night would be just as sweet as if he had a Cornish pump under his charge. The direct-acting pump will be just as reliable, flexible, and durable, and at a much smaller first cost. Anybody that has an insight in the manner in which pumping engines are purchased will, however, understand that a manufacturer who offers a pump at a price five times that of other builders stands no chance of selling his pump, no matter how well he may argue the three good points mentioned.

F. F. NICKEL.

Hazleton, Pennsylvania, June 22.

HISTORICAL GEOLOGY OF CALIFORNIA.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM FORSTNER.

(Continued From Page 392, June 26.)

Tertiary (Cenozoic).

Coast Ranges and Great Valley. There has been much controversy regarding the stratigraphic relation of the Eocene Tejón and the Cretaceous. Apparently the stratigraphic continuity of the Tejón and the Chico is well established, and the non-conformity observed in several places is due to the contact with Lower Cretaceous strata.⁵⁷ The lower member of the Eocene, in Contra Costa county, is called the Martinez, and consists of a thick accumulation of sandstone. In central California the Eocene is represented by the Tejón, usually an extremely light-colored sandstone, often containing concretions, with subordinate shale and some limestone lenses. It constitutes the coal-bearing horizon of central California.⁵⁸ The Eocene is sparingly represented on the coast north of Ventura county, but well developed along the western and southern edges of the San Joaquin valley, and extends along Ventura county toward the ocean, until it is finally buried under more recent deposits. This seems to indicate that during the Eocene the Great Valley formed an arm of the ocean, with an outlet at the southern end.⁵⁹ In the San Rafael range, Santa Maria district, is a great series of dark-colored shales, alternating with massively bedded sandstone, which has not been differentiated. Probably Knoxville strata occur at the base; the higher strata represent the Upper Cretaceous or the Eocene, or both, while it may include at the top, part of the Lower Miocene. The Santa Ynez range is mostly composed of a terrane equivalent to all of the Tejón and the Lower Miocene. The Eocene and Lower Miocene beds are conformable. In southern Santa Barbara county, the Eocene is represented by the Topatopa formation, and the conformably overlying Sespe formation, which may be partly Oligocene, which in turn is overlaid conformably by the Lower Miocene Vaqueros.⁶⁰ (See also below, Southern California). On the coast north of Santa Barbara county, a probable Eocene series is reported at Carmelo bay, Monterey county, which appears to be identical with the coal-bearing sandstones of Malparo canyon, about two miles distant, which are believed to be of Tejón age. This series of sandstones and conglomerates, with some argillaceous shales, is named the Carmelo series.⁶¹ Some sandstone beds near Pillaritos, on the peninsula of San Francisco, are also probably of Tejón age.⁶²

Along the southwestern edge of the San Joaquin

valley the Eocene forms several belts swinging northward in a broad curve around the outer flanks of the San Benito mountains. The lower member consists of concretionary sandstone, usually with conglomerates at the base, the Avenal sandstone; the middle member consists of brown, bituminous, or carbonaceous shale, with sands and clays, the Kreyenhagen shales. The coal mines near Coalinga are in these shales; the upper member is better developed north of Coalinga, and consists of but slightly consolidated sands, the Domijean sands.⁶³ In the vicinity of Coalinga the Eocene is oil-bearing, probably the shale middle-member.^{63 64} There is no general unconformity between the Eocene and the Miocene, suggesting that no profound disturbances occurred at, or near, the close of the Eocene. In many places, however, the Eocene was greatly eroded before the deposition of the Miocene.⁶⁵ This relation suggests that the differential oscillations, and intervening periods of quiescence, worked out in detail for the Klamath region and the Coast range in northern California in Bulletin 196, U. S. Geol. Survey, holds good, at least to a certain extent, for the entire California Coast region.

The Oligocene is, as yet, only recognized in one locality in California; on the San Lorenzo river, Santa Cruz county. It is called the San Lorenzo formation.⁶⁶ The Miocene is subdivided into four subdivisions: the Vaqueros or Temblor (Lower), the Monterey, the Contra Costa Miocene, and the San Pablo (Upper). The Vaqueros, also called the Temblor, or the Agasoma zone, consists prominently of sandstone, and represents the Lower Miocene shore-deposits, while the Monterey shales are deep-water sediments, indicating a gradual subsidence during the early and Middle Miocene.⁶⁷ The fauna of the Lower Miocene differs to some extent in the Coast region from that in the great valley. It would therefore appear that the sea had not reached as far east in the earliest Miocene as it did later, and that the thick shale-beds, overlying the lower sands in the Coast region, were formed while sandy beds were deposited to the east.⁶⁸ On the coast the Vaqueros contains, near the base, considerable conglomerate; and in San Luis Obispo county, and at Point Sal, beds of volcanic ash are intercalated, indicating volcanic activity during the period of their deposition.⁶⁹ This occurrence must, however, be considered local, as east of the Santa Lucia range no volcanic ashes are found in the Vaqueros. The Temblor beds, on the east slope of the Mount Diablo range, consist of sandstone and shale.⁷⁰ On the coast of Santa Barbara

⁵⁷Proc. Cal. Acad. of Sci., 3rd series, Vol. II, pp. 162-168.

⁵⁸Bull. No. 19, Cal. Sta. Min. B., p. 136; Bull. No. 357, U. S. G. S., pp. 26-29.

⁵⁹Mon. XIII, U. S. G. S., pp. 214-218; Proc. Cal. Acad. Sci., 3rd series, Vol. II, No. 2, p. 184.

⁶⁰Mon. XIII, U. S. G. S., pp. 214 and 300; Bull. Geol. Soc. Am., Vol. II, p. 392; 22nd Ann. Rep., U. S. G. S., Pt. I, p. 273; Geol. Sur. Cal. Geol., Vol. I, pp. 31 and 34; and Bull. No. 19, Cal. Sta. Min. B., p. 139.

⁶¹Folio 101, U. S. G. S.

⁶²Bull. No. 321, U. S. G. S., pp. 22-26; and Bull. No. 322, U. S. G. S., pp. 28-33.

⁶³Bull. Dpt. of Geol. Univ. of Cal., Vol. I, p. 6.

⁶⁴15th Ann. Rep., U. S. G. S., p. 458.

⁶⁵Auriferous Gravels, p. 26; Mon. XIII, U. S. G. S., p. 192; 15th Ann. Rep., U. S. G. S., p. 467; Proc. Cal. Acad. of Sci., 3rd series, Vol. II, p. 184; Prof. Paper No. 47, U. S. G. S., p. 18; Bull. No. 19, Cal. Sta. Min. B., p. 107.

⁶⁶Prof. Paper No. 47, U. S. G. S., p. 16.

⁶⁷Prof. Paper No. 47, U. S. G. S., p. 18; and Water Supply & Irrigation Paper No. 89, U. S. G. S., p. 15.

⁶⁸Bull. Dpt. Geol. Univ. of Cal., Vol. III, No. 16, p. 381.

⁶⁹Folio 101, U. S. G. S.; Bull. Dpt. of Geol. Univ. of Cal., Vol. II, No. 1, pp. 15-17.

⁷⁰Proc. Cal. Acad. of Sci., 3rd series, Vol. II, pp. 170-172; Bull. No. 357, U. S. G. S., pp. 31-35.

county the Vaqueros lies conformably upon the Eocene, and in the Santa Ynez range the Vaqueros and the Eocene are so closely related that they cannot be differentiated.⁷¹ The Monterey shales, or bituminous shales, consist of a thick series of more or less silicious, organic, deep-water sediments, forming partly white, soft, porous, and chalk-like shales, partly dense, compact, light-gray, regularly banded flinty layers. These shales are generally bituminous. At many places the shales are inter-stratified with sandy beds, suggesting that during their deposition deep-water and shallow-water conditions oscillated.⁷² This formation is widely distributed through the Coast region, south of the bay of San Francisco, bordering the coast at many points, and forming a conspicuous, although not continuous, terrace along the river valleys and the west rim of the San Joaquin valley, that generally rests conformably on the Vaqueros sands. Occasionally the latter are absent, and the shales rest unconformably upon Cretaceous or Franciscan rocks. In the vicinity of the bay of San Francisco the Monterey shales consist of thin beds of dark, flinty chert, weathering white, alternating with thin bands of dark-brown shale, of a bituminous character, with numerous beds of whitish, fine-grained sandstone and lenses of limestone. The significance of the above rhythm of sedimentation, similar to that of the Franciscan radiolarian chert, is not clear.⁷³

Further south along the coast, the Monterey consists of white or light-yellowish, shaly strata, generally soft and chalky, of a porous character, due to hollow molds of minute organisms, and beds of a compact, light-gray, and opal-like flinty rock. At Point Sal the basal portion of the bituminous Monterey is a stratum of gypsiferous clays, overlying a sandstone, probably equivalent to the Vaqueros.⁷⁴ Although some volcanic material is probably present in the Monterey shales, their main character is that of organic deep-water deposition. These Miocene shales probably form the principal horizon from which most of the oil in California is derived.⁷⁵ In many portions of the southern Coast Range region the Monterey is distinguished by its diatomaceous character. The highest grade of diatomaceous earth is found in San Miguelito canyon, south of Lompoc. This diatomaceous earth belongs to the upper division of the Monterey shales.⁷⁶ At many places the Monterey oil-bearing shale has been altered, through combustion of the hydrocarbon content, into a pink or deep brick-red shale, or into a hard, vesicular rock-like scoriaceous lava.⁷⁷ After the deposition of the

Monterey shales, an uplift must have taken place, raising the entire region of western California above deep-sea conditions, partly above sea-level into the zone of erosion.⁷⁸ Whether the Contra Costa Miocene, which is only found in the vicinity of Mount Diablo, is the remnant of a Monterey shore-deposit, or of a post-Monterey deposit, is apparently still an open question. The Upper Miocene, San Pablo formation, consists chiefly of sandstones, with considerable tuff, especially in the upper portion. The San Pablo generally rests unconformably upon the underlying Miocene strata, although in some localities this unconformity is hard to trace.⁷⁹ The post-Monterey uplift must have brought part of the Coast region above sea-level, for in places the San Pablo is missing. In the northern Coast Range, at Point George and at Crescent City, the Upper Miocene is represented by the Empire beds; and northeast of Crescent City by the Wymer beds, soft, iron-stained, slightly indurated shaly sands. The lower portion of the Wildcat series at Rio Dell on Eel river, near Ferndale, is also probably Upper Miocene. Southwest of Covelo, Mendocino county, on Middle Fork at the mouth of Salt creek, is a probable Miocene deposit containing a bed of coal.⁸⁰

In San Luis Obispo county, there is a difference between the San Pablo east of the range (the Santa Margarita beds), and the San Pablo west of the range (the Pismo beds). In the upper Salinas river, and in San Luis Obispo county, the San Pablo contains diatomaceous beds.⁸¹ The Ione formation is its correlative in the Sierra region. In Tulare county the Ocaya creek beds are probably its correlative.⁸² Near Coalinga the San Pablo is represented by the Coalinga beds, which, however, may be the equivalent of the Contra Costa Miocene, and by the Etchegoin beds, consisting of bluish sands or gravels, overlaid by the San Joaquin clays, presenting a banded appearance due to the difference in color. The Coalinga beds are named the Jacalitos formations by the U. S. Geological Survey.⁸³ In the Berkeley hills the Orindan and the Trampan formations are the equivalents of the upper San Pablo. The tuffs of the latter are found at the base of the fresh-water Orindan, and the fauna of the overlying Trampan is closely allied to that of the San Pablo.⁸⁴ Along the coast in Santa Barbara, Ventura, and Los Angeles counties, the Miocene strata above the Monterey shales are not differentiated from the Pliocene Fernando formation, which includes probably some of the Upper Miocene. In the Summerland district it rests unconformably upon the Monterey, but in the Santa Ynez range this unconformity is slight, and the break between the two

⁷¹Bull. No. 321, U. S. G. S., p. 26, and No. 322, pp. 28-33.

⁷²Prof. Paper No. 47, U. S. G. S., p. 20; Geol. Sur. Cal. Geol., Vol. I, p. 137; and 22nd Ann. Rep., U. S. G. S., Pt. I, p. 373.

⁷³Bull. Dpt. of Geol. Univ. of Cal., Vol. II, No. 12, pp. 363-367 and 444.

⁷⁴Bull. Dpt. of Geol. Univ. of Cal., Vol. I, No. 1, pp. 22-28, and Vol. II, No. 1, pp. 9-15; and Folio 101, U. S. G. S.

⁷⁵Bull. No. 19, Cal. Sta. Min. B., p. 183; and Bull. No. 321, U. S. G. S., p. 29, and No. 322, pp. 33 and 75.

⁷⁶Bull. No. 321, U. S. G. S., p. 27, and No. 322, pp. 36-38, and No. 315, pp. 438-477; and Bull. No. 38, Cal. Sta. Min. B., pp. 289-296.

⁷⁷Bull. No. 322, U. S. G. S., p. 48; and Jour. of Geol., Vol. XV., pp. 750-758.

⁷⁸Folio 101, U. S. G. S.; Bull. Dpt. Geol. Univ. of Cal., Vol. II, No. 12, p. 446; and 15th Ann. Rep., U. S. G. S., p. 467.

⁷⁹Prof. Paper No. 47, U. S. G. S., p. 22; Bull. Dpt. of Geol. Univ. of Cal., Vol. II, No. 4, p. 114; and 22nd Ann. Rep., U. S. G. S., Pt. I, p. 376.

⁸⁰Bull. No. 196, U. S. G. S., pp. 31-41.

⁸¹Folio 101, U. S. G. S.; Bull. No. 357, U. S. G. S., pp. 35-40.

⁸²14th Ann. Rep., U. S. G. S., Pt. II, p. 46.

⁸³Proc. Cal. Acad. of Sci., 3rd series, Vol. II, pp. 174-181, and 4th series, Vol. III, pp. 22-28; Bull. No. 357, U. S. G. S., pp. 40-46.

⁸⁴Bull. Dpt. of Geol. Univ. of Cal., Vol. II, No. 12, pp. 447 and 448.

formations is mainly indicated by the change in character of the deposits from organic, probably deep-water sediments, to sandy and gravelly deposits derived from erosion.⁸⁵ There is no doubt that the Upper Miocene represented a period of volcanic activity, synchronous with that in the Sierra region. During this period occurred the post-Miocene uplift of the Coast range, which was followed by the post-Miocene interval of high altitudes and erosion. This period of erosion must have lasted a long time, for in places the Upper and Middle Miocene was entirely removed, and the underlying strata laid bare.⁸⁶ After the post-Miocene interval of high altitudes, the Pliocene period of depression was initiated, during which, not only the coast, but also the valleys which had been developed during the previous period, were



Flinty Monterey Shale (Middle Miocene), Santa Barbara County.

(Photograph by Arnold, U. S. G. S.)

filled with delta deposits, while the hills were worn down nearly to base-levels. Remnants of these delta deposits are found on the coast, in the river valleys and in the great valley, and are particularly well exposed in the San Benito and Salinas valleys. Most probably an orogenic movement took place at the close of this Pliocene period of sedimentation, over a large part of the West Coast, which caused the upthrust of the mountains in western Humboldt county, of the granitic Montara mountains, of Mount Diablo, and the buckling in the drainage of the San Benito valley which forced the San Benito river to find an outlet through the Pajaro valley. These orogenic deformations antedate the post-Pliocene epeirogenic

uplift of the Coast region. These mountain-making movements were, however, not adequate to efface the peneplain, and the general altitude of the coast was not affected; the base-leveling process continued, and the peneplain was extended between the bolder masses of the disturbed district. At the close of the Pliocene the topography was that of an approximate peneplain, with numerous peaks and ridges above the general level, while the coast had the aspect of an archipelago.⁸⁷ The Pliocene formations have different names in the various portions of the Coast region. The Purisima formation forms the lower horizon of the Pliocene. Its fauna is transitional toward the Miocene and is related to the San Pablo, but the major portion is undoubtedly Pliocene. Part of the Wildcat series is contemporaneous with the Purisima. It consists of a series of conglomerates, fine sandstones, and sandy shales, and is named after its type locality near the mouth of Purisima creek, San Mateo county.⁸⁸ In the northern Coast range, near Eel river, the Pliocene is represented by the Wildcat series. This terrane occupies a large part of Humboldt county, north of Bear River ridge. At Ferndale the series is about one mile thick, consisting of clays, sands, sandstones, and conglomerates; the clays are most abundant at the bottom, the sands and sandstones predominate in the middle, and the gravels in the upper portion. Toward Scotia the beds become more arenaceous, indicating an approach to the shore line of the basin of deposition.⁸⁹ Along the coast, in the San Francisco peninsula and southward, the Merced consists chiefly of sandstones, with local admixtures of clayey material; occasionally there are thin lignite seams, and near the north end is a thin bed of volcanic ash. It is one mile thick, and rests unconformably upon the Franciscan.⁹⁰ In the river valleys of the Coast region the Merced is represented by the Paso Robles formation, a fresh-water deposit of approximately horizontal gravels, and sandy and marly clays, unconformable with the Miocene. These gravels are generally vigorously sculptured, forming a series of cliffs. The Paso Robles is also found west of the Santa Lucia range. In Lake county the Cache Lake beds belong to the Upper Pliocene, and the eruptions of andesites (asperites) appear to have been contemporaneous.⁹¹ On the south side of the bay of San Francisco the Upper Pliocene is not represented, but a pre-Merced heavy series of volcanics was laid down above the Upper Miocene (Orindan and Tramp). This series consists of the Lower Berkeleian, Upper Berkeleian, and Campan formations, principally tuffs and lavas. In the Upper Berkeleian an extensive succession of fresh-water deposits is contained, called the Siestan formation, and in the Campan are

⁸⁵Bull. Dpt. of Geol. Univ. of Cal. Vol. I, No. 4, p. 157, and Vol. I, No. 8, pp. 262, 269, and 270; and Folio 101, U. S. G. S.

⁸⁶Prof. Paper No. 47, U. S. G. S., pp. 25 and 26.

⁸⁷Bull. Dpt. of Geol. Univ. of Cal., Vol. I, No. 8, pp. 255-261; and Bull. No. 196, U. S. G. S., pp. 36-41.

⁸⁸15th Ann. Rep., U. S. G. S., p. 459; Bull. Dpt. of Geol. Univ. of Cal., Vol. I, No. 4, pp. 142-147; and 22nd Ann. Rep., U. S. G. S., Pt. I, pp. 377 and 378.

⁸⁹Bull. Dpt. of Geol. Univ. of Cal., Vol. I, No. 4, pp. 152-154; and Folio 101, U. S. G. S.; and Mon. XIII, U. S. G. S., pp. 219-223.

⁹⁰Bull. No. 321, U. S. G. S., p. 30, and No. 322, pp. 52 and 53.

⁹¹Bull. Dpt. of Geol. Univ. of Cal., Vol. I, No. 4, p. 151; Folio 101, U. S. G. S.; 15th Ann. Rep., U. S. G. S., p. 467; and Mon. XIII, U. S. G. S., p. 461.

some small lenses of limestone.⁹² Along the western border of the San Joaquin valley the Pliocene is represented by the Tulare formation, a thick stratum of gypsiferous sands and clays, which are exposed at intervals. They lie conformably upon the San Joaquin clays, and it is not always possible to distinguish between the two. These beds might be correlated with the Orindan beds.⁹³

In Santa Barbara county the Pliocene is represented by the Fernando formation, clay and clayey shale, sandstone, and conglomerate, the last two being oil-bearing at Summerland. This formation contains probably at its base the Upper Miocene strata, and at its top, part of the lowest Pleistocene. It rests generally unconformably upon the Miocene, and local unconformities occur within the series.⁹⁴ In passing southward along the western foothills of the Sierra Nevada, the Tertiary and Cretaceous strata are found resting nearly horizontally upon the upturned strata of the metamorphic series. At the point, however, where the Sierra Nevada turns westward, near Fort Tejon, the Tertiary strata are suddenly elevated at a high angle. This transition probably indicates a line of faulting, of which the northern continuation is apparently followed by the San Joaquin and Sacramento rivers.⁹⁵

(To be Continued.)

Antimony is found in many gold and silver ores, and when these ores are smelted the antimony combines with the lead of the charge to form antimonial lead. By this indirect means a considerable amount of antimony is produced, though it goes on the market as antimonial lead, for which there is a large demand and from which the metallic antimony is never separated. At present China produces the greatest quantity of antimony ores. France, Italy, Austria, Bohemia, Turkey, Mexico, and New South Wales are all considerable producers, and many other countries contribute lesser amounts to the world's supply. Japan was at one time a large producer, but her known deposits are now reported to be much depleted. The low prices now prevailing do not permit profitable production in the United States, as most of the known antimony deposits are in parts of the country where freight rates and wages are high. According to reports received by the United States Geological Survey, no antimony ore was shipped during 1908, though some was mined and held at Burke, Idaho.

The Bohemia mining district, in Lane and Douglas counties, Oregon, is described in a brief report by D. F. MacDonald, of the U. S. Geological Survey. The ore deposits are fissure veins which contain free gold, and have been developed by several mines. Mr. MacDonald sketches the general geology, the ore deposits, and the mining development of the district, and includes notes on the mode of ore deposition.

⁹²Bull. Dpt. Geol. Univ. of Cal., Vol. II, No. 12, pp. 374-410, and pp. 448-450.

⁹³Proc. Cal. Acad. of Sci., 3rd series, Vol. II, pp. 181 and 182; Bull. No. 3, Cal. Sta. Min. B., pp. 49 and 55; and Bull. No. 357, U. S. G. S., pp. 56-61.

⁹⁴Bull. No. 321, U. S. G. S., pp. 30 and 31, and No. 322, p. 52.

⁹⁵17th Ann. Rep., U. S. G. S., Pt. I, p. 530; Geol. Sur. Cal. Geol., Vol. I, p. 167; and Am. Geol., Vol. XIII, p. 248.

NEW ZEALAND PLACER MINES.

In 1908, 53 New Zealand dredging companies, employing 504 men, produced 56,554 oz. gold, valued at £221,089, according to the *Australian Mining Standard*. The expenditure for the year amounted to £180,704. These companies are capitalized at £455,500 and have a total recorded production of 488,794 oz., equal to £1,898,309. The dividends paid have amounted to £685,059. The corresponding figures for 37 mining and sluicing companies are: men employed, 420; capital, £424,650; gold won in 1908, 17,896 oz., equal to £69,940; expenditure in 1908, £75,455; total gold won since registration, 240,798 oz., equal to £789,707; total expenditures, £727,625; total dividends, £161,478.

Among the important localities for placer gold is the Ourawera valley in Otago. The Round Hill Mining Co., Ltd., successor to the Round Hill Synd., Ltd., has here a concession for working 140 acres of alluvial ground. Water is conveyed more than 50 miles and used at a pressure of 130 lb. The gold is fine and is saved, with a small amount of platinum, by means of angle-iron riffles and cocoanut matting. The company is capitalized at £50,000 and has paid £3248 in dividends from a total production of £115,747. In 1908, gold to the value of £9673 was produced, the expenditures amounting to £7032.

In the same neighborhood is the Ourawera Gold Mining Co., which has a claim of 40 acres at Round Hill, and is one of the most successful mining ventures that has been launched in Southland. According to the *New Zealand Mines Record* it commenced operations a little more than 12 years ago, with a nominal capital, fully subscribed and paid up, of £3000. Since then it has produced 9689 oz. of gold, valued at £38,563, and paid in dividends £12,415. Of late years it has almost ceased to be profit-earning, but it is still active, and has prospects of again returning rewards to shareholders. At the last half-yearly meeting the directors, in their report, stated that their anticipations of six months ago had not been realized. The ground worked had been irregular in depth, and generally much poorer than was expected, and the gold won had just about cleared expenses. The elevator had been shifted to Italian Gully, which is supposed to be the richest part of Round Hill, and the ground would be tested very soon. An aerial tramway had been erected, which, worked by the hydraulic winch, should effect considerable economy in the removal of stones and logs, as its operation would be quicker than that of a dredge. The value of the gold won during the half-year was £957, and the total expenditure was £985 0s. 2d. The assets of the company were valued at £3143 8s. 3d., and it had no liabilities except that to its shareholders for the paid-up capital.

Production of tin in Bolivia, according to Alfred A. Winslow, Consul at Valparaiso, amounted to 65,863,891 lb. in 1908, against 60,891,116 in 1907. The great Potosí mines produced nearly one-half of the entire output. On the tin exported the Bolivian Government in 1908 collected an export tax of \$240,279 United States gold.



Ourawera Valley, Otago, New Zealand. View of Dam at Head of Main Pipe Line, Round Hill Gold Mining Co.
(Reproduced by the courtesy of the Mines Department, New Zealand.)



Paddock of Round Hill Gold Mining Co., on Ourawera River, Otago, New Zealand.
(Reproduced by the courtesy of the Mines Department, New Zealand.)

PROPOSED LAW GOVERNING OIL LANDS.

The following act has been proposed in a bill introduced in the House of Representatives at Washington by S. C. Smith of Bakersfield. It provides, in Section 1, that public lands of the United States in the State of California chiefly valuable for mineral oil or asphaltum may be acquired under the provisions of this Act, and not as placer mining claims.

Sec. 2. That any citizen of the United States over the age of 21 years, and any person who has filed his declaration of intention to become such citizen, may file a declaration, under oath, with the register and receiver of the land district where such land is situated that he intends to claim and improve or cause to be improved for the oil or asphaltum thereon a tract of land, describing it, not exceeding 160 acres. If such land be surveyed, it shall be located by legal subdivisions, and if unsurveyed, it shall be located in rectangular form. In no case shall a claim be more than one mile in length. Such oath shall state that the affiant believes such land to be chiefly valuable for its deposits of mineral oil or asphaltum and distinctly his reasons for so believing; that he intends to make or cause to be made a bona fide effort to produce oil or asphaltum on said land in paying quantities; that he has not previously claimed any land in the same county under the provisions of this Act. Upon filing said declaration, the declarant shall pay to the receiver a fee equal to 25c. per acre of the land claimed, and thereupon the register shall enter such application upon his books, and no entry or filing shall thereafter be received for said land until such claim has been abandoned, as herein provided. But nothing herein contained shall be held to deny or abridge the right to enter said lands for the purpose of discovery and development of metalliferous minerals nor the assertion of a mineral claim thereto.

Sec. 3. That at any time within three years from the filing of the claim aforesaid the claimant or his assigns may file an application for patent. Such application shall show the applicant's right to or interest in said claim; that there has been made such drillings or excavations on said claim as enables the claimant to produce oil or asphaltum, or both, in commercial quantities; the character and extent of the improvements thereon; that the land is valuable for its deposits of oil and asphaltum and is sought chiefly for the oil and asphaltum therein contained, and that it is the bona fide intention of the applicant to produce such products therefrom in commercial quantities; if the application be made on behalf of one or more individuals, that each of them is a citizen of the United States over the age of 21 years, or that he has made his declaration of intention to become such; if on behalf of a corporation, that it is duly organized under the laws of some State or Territory, and has a valid charter authorizing it to take, own, and operate such property. Application on behalf of an individual shall be made by himself; on behalf of two or more, by either of them; and on behalf of a corporation, by the president, vice-president, or secretary thereof. At final proof documentary evidence shall be submitted as to matters of record; and as to the character of the land, the improvements, and produc-

tion there shall be furnished the testimony of two disinterested witnesses. No individual or corporation shall be a party to final proof proceedings under this Act on more than one claim: Provided, that if there are any veins or lodes of quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits known to exist at date of filing such application for patent, title thereto shall not pass under any application, entry, or patent under the provisions of this Act, but are hereby expressly declared to be reserved therefrom, and such known veins or lodes shall be subject to location and entry by any qualified person or persons under the provisions of the existing United States mining laws applicable thereto: Provided, however, that any declarant who discovers any vein or lode bearing asphaltum, gilsonite, elaterite, or other like substances within the limits of the land included in his declaration or entry under this Act shall have the preferential right for a period of 90 days after discovery of such vein or lode within which to locate same under the provisions of the general mining laws of the United States, and must file with the register and receiver of the land district where the land is located a copy of the location notice.

Sec. 4. That upon receiving and filing an application for patent such notice shall be given and such proceedings had as are required for final proof on a mineral entry. If the final proofs are satisfactory, patent shall be issued upon payment to the receiver of the sum of \$5 per acre.

Sec. 5. That proceedings under this Act shall not give the claimant, before patent, any right to the surface of said land for agricultural, grazing, nor for any other purpose than that permitted by this Act, nor the right to fence or enclose the land (except corrals for protection of domestic animals), nor the right to take any wood or timber therefrom, except fuel for domestic purposes used thereon or in the vicinity of the lands by those engaged in the development of the oil or asphaltum thereon.

Sec. 6. That during each year after the filing of said declaration and before final proof the claimant or his successors in interest shall pay to the receiver a sum equal to 50c. per acre of said claim, or submit proof, supported by two witnesses, that he has expended during said year an equal sum in a bona fide effort to discover and produce oil or asphaltum on said claim or on land at a point within one mile of said claim, where no discovery of oil or asphaltum has been made in a shaft or well within three miles of said claim.

Sec. 7. That the following shall constitute an abandonment of a claim under this Act: First. Failure to make the annual payment or the expenditure herein required. Failure to file proof of such expenditures shall be prima facie evidence of a failure to make such expenditures. Second. Failure to apply for patent within the time specified. Third. Filing a declaration of abandonment with the register of the land office.

Sec. 8. That anyone holding and owning a valid mining claim for land chiefly valuable for the oil or asphaltum thereon may abandon said mining claim and re-enter the same under this Act, or so much

thereof as he is entitled to enter under this Act, in the following manner: He shall execute and deliver to the register of the land office an instrument in writing surrendering and conveying to the United States all right, title, and interest in and to said land. Said instrument shall be executed and acknowledged so as to be entitled to be recorded under the laws of the State where the land is situated. Upon delivering said instrument to the register, together with the fee for recording the same in the county where the land is situated, the mining title shall be extinguished, and the party surrendering the title may thereupon make his entry as herein provided. The register shall immediately cause said conveyance to the United States to be duly recorded in the county where the land is situated.

Sec. 9. That an Act entitled "An Act to authorize the entry and patenting of land containing petroleum and other mineral oils under the placer mining laws of the United States," approved February 11, 1897, and all other laws, so far as they allow oil or placer asphaltum claims upon the public lands in the State of California, are hereby repealed, but nothing in this repeal shall affect proceedings heretofore begun to acquire title under any of said provisions of law so repealed.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

F. A. A., Mogollon, New Mexico.—Hematite.

W. H. S., Columbia, California.—Pyrite and arsenopyrite in quartz.

W. H. B., San Francisco, California.—Clay containing a little pyrite.

D. F. D., Bodie, California.—No. 1, anglesite and hematite; No. 2, quartz with a little olivine; No. 3, pyrite in quartz; No. 4, specular hematite and limonite.

J. S. L., Ibapah, Utah.—No. 1, fluorite and pyrite; No. 2, a light green iron mineral (too small in amount for determination), giving a weak test for arsenic. No trace of copper, nickel, silver, or lead.

C. H., Guanajuato, Mexico.—(a) rhyolite with crystals of magnetite and cerussite on the surface; (b) rhyolite discolored by hematite; (c) rhyolite with crystals of magnetite; (d) rhyolite with hematite and magnetite; (e) slate containing a little pyrite; (f) quartz or vein material in decomposed schist or slate; (g) quartz in what was probably a slate; (h) rhyolite.

L. N. W., Nevada City, California.—No. 5, impure chromite, showing slickensides; No. 6, quartzose schist, mostly quartz, discolored by limonite; No. 7, a highly decomposed schistose rock; No. 8, highly decomposed schistose rock, now largely kaolin; No. 9, a decomposed quartzose schist discolored by hematite; No. 10, hydromica or hornblende schist containing quartz and pyrite; No. 11, a decomposed quartzose schist discolored by hematite.

ANDEAN PLACERS.

Goldfields in Peru and Bolivia east of the Andes have been described by W. M. Conway before the Royal Society of Arts. On the Beni river below the gorge at Guanay is an old lake basin filled with gravel carrying as much as \$4.23 gold per cubic yard. On the neighboring Inambari river gold has also been found. In both cases deep and flat-lying gravels occur. Companies have been formed to mine them. The various experts who have examined these gravels have tested surface gravels only. At Incahuara, however, many pits were dug and the ground was explored to a depth of 16 ft. and found to be rich. At no place has bedrock been reached. Neither has the bed of either river been examined. Only one method of working these gravels is practicable, and that is by dredging. There is not grade enough for sluicing. At Incahuara there are no boulders, the largest stones being little bigger than a man's head. Most of the reaches of the lower Inambari, except where torrential side streams enter, are also void of boulders. On both rivers the ground is loose, a mere mixture of stones and sand without hard clay. The current of neither river at proposed dredging points is swift enough to make trouble for a dredge. In flood time it can float over and excavate the banks or can be worked in a paddock. During low water it can work the bed of the stream. The transport of dredges to these remote places is difficult and costly.

The extent of the two dredging grounds is not known. The only part of the ground yet examined thoroughly is the Incahuara basin. This contains 10,000,000 yd. of workable gravel to a depth of 30 ft. Its surface has been sampled and has nowhere been found to yield less than 38c. per cubic yard, while large areas yield an average of at least \$1 and in many places much more. The bedrock value is likely to be much higher, and so is that of the actual bed of the stream. An average of 75c. per cubic yard is not an extravagant estimate. At this rate the Incahuara basin alone contains \$7,500,000 worth of gold. For 100 miles below the Incahuara basin it is believed that the Beni gravels yield gold. There are numbers of places where it has been definitely found.

On the Inambari a much longer stretch has been actually sampled than along the Beni, and as much as \$5.30 gold per cubic yard has been obtained. The Inambari, therefore, is likely to yield as much gold as the Beni. The lower tributaries of both rivers contain alluvial gold. Indications point to the conclusion that this part of the eastern slope of the Cordillera is a real goldfield of great size and importance. Its southern limit seems to be about the latitude of Mt. Illimani, but its northern limit is unknown. That it reaches far to the north of the Inambari valley is probable. Gold is reported on the Yucayli river and elsewhere, but the information is at present vague.

Tin is won by dredging at Tongkah or Puket, in Siam. According to *In Tinland*, The Tongkah Harbor Tin Dredging Co.'s dredge No. 2 worked 282 hours in March and produced an output of 270 piculs, equivalent to 18 tons of clear tin.

COMPOUND CORNISH PUMPING ENGINES.

Written for the MINING AND SCIENTIFIC PRESS
By W. PERCY GAUVAIN.

A misapprehension seems to be current as to the working of the compound Cornish pumping engine, hence I venture to offer a few remarks on the latest type, which may be of interest. In the first place, it would be as well to study the general principles which govern the working of the Cornish engine. It is hardly necessary to mention that an engine working on the Cornish cycle has simply to lift the pump-rods and draw in a charge of water. On the down stroke, the engine being in equilibrium, the weight of the rods forces up the water. The pump-rods should therefore be heavier than the water load, any extra

it is lifting the pump-rods, is about twice the speed of the water stroke, and for this reason the suction pipes and valves should be large, generally two suction valves and one delivery valve being employed. The Cornish engine used for mining work is usually more economical than when it is used for waterworks purposes, for the reason that as a mining engine the weight of the pump-rods usually far exceeds the water load, while the balance weight on the waterworks engine is little in excess of the load on the plunger. There is, however, a limit to the number of expansions, for increasing the weight and velocity of the moving parts puts greater stresses on the pump-rods and connections, so that steam of a higher pressure than 40 or 50 lb. cannot be used effectively. It will be seen, therefore, that there would be no extra economy in using steam, say at 150-lb. pressure, in the single-cylinder Cornish engine, for the number of expansions is limited to four or five. At

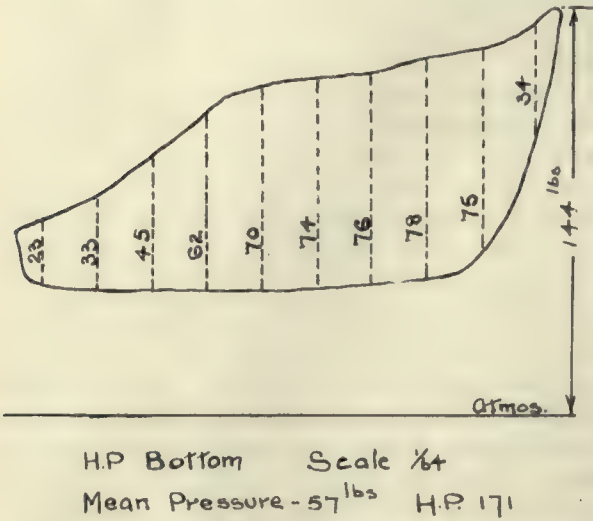


Fig. 1.

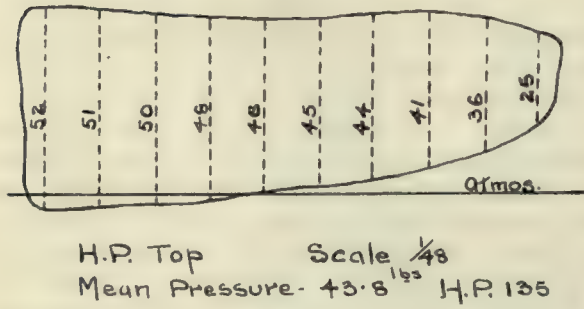


Fig. 2.

weight over the water load, plus the friction of the engine and pumps, being taken up by means of balance-bobs.

The Cornish engine takes advantage of the momentum of the pump-rods to enable it to use steam expansively—in fact, the rods are to it what a fly-wheel is to a rotative engine. The energy stored in the rods is expressed by the formula $\frac{W}{2} \frac{V^2}{g}$, where W is the weight of the moving parts, V the velocity in feet per second, and $g = 32.2$. It will be seen, therefore, that the degree of expansion depends on (1) the weight of the moving parts, and (2) the velocity which they attain, and as the weight is constant for a given engine, any increase in the degree of expansion employed increases the value of V. For the purpose of expansive working, the speed of a Cornish engine during the steam stroke, that is, when

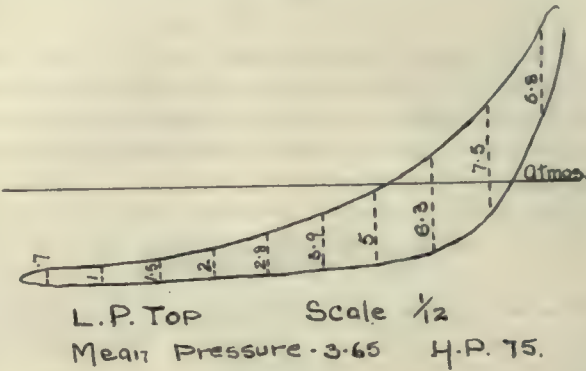


Fig. 3.

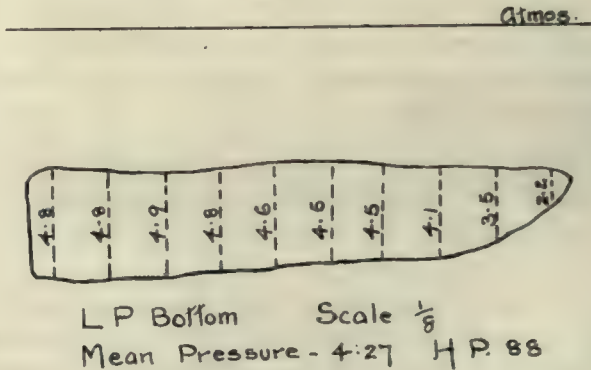


Fig. 4.

the same time, there would be no advantage in compounding the engine if only low steam-pressures were used.

The idea of compounding the Cornish engine originated with Hornblower, and several engines were erected, by Woolf, Trevithick, Sims, and Gribble. In 1810 Woolf introduced his compound engine into Cornwall. In 1814 one of his engines, working at the Wheal Abraham, attained a duty of 35 millions. It should be observed that up to 1856 the duty was calculated on the basis of one bushel of coal equivalent to 94 lb.; after that date 112 lb. was substituted for the bushel. This engine in May 1816 attained a duty of nearly 57 millions. After this date the duty decreased, and it did not exceed the average of the best single-cylinder engines.

For low steam-pressures the Cornish cycle is un-

questionably the most economical, and engines working on this cycle have a much lower steam-consumption than any other type.

The adoption of high-pressure steam, with its resultant economies, led to the introduction of the compound Cornish type, working with steam pressures up to 150 lb. per sq. in. This type of engine was introduced by Davey, who has applied it in a number of cases with successful results. Henry F. Collins has, in the issues of the MINING AND SCIENTIFIC PRESS of February 20 and 27 last, written two interesting articles on 'Cornish Pumps and Pumping Engines', and he clearly shows why the Cornish engine has been so largely adopted, and why it seems likely that it will continue to be adopted in the future, in spite of competition from other types of pumping engines. I cannot, however, agree with a portion of his article in the issue of February 27. In order to prove his assertion that little if any economy is secured by the compound over the ordinary single-cylinder engine, he takes two examples of engines in use, a 90-in. Cornish engine about 40 years old, and a compound Cornish engine about five years old. The efficiency of the old Cornish engine is shown to be 90.16%, while that of the compound Cornish engine is 85.6%. I venture to suggest that an efficiency

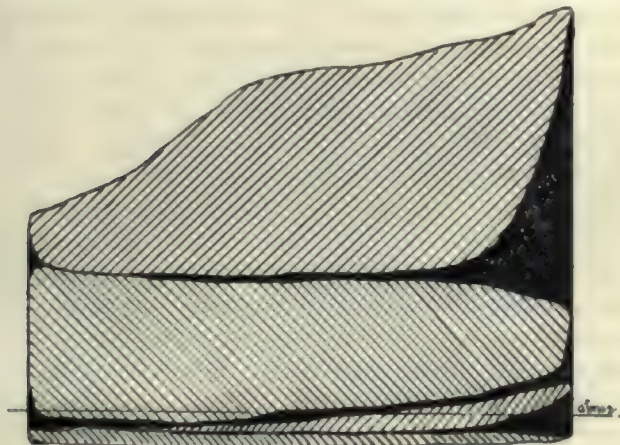


Diagram illustrating distribution of steam in a Compound Cornish Engine.

Fig. 5.

of 90.16% is impossible on such an engine as he describes. This engine has eight plungers, each 16 in. diam., and the friction in each gland, that is, provided they are kept without leakage, will be considerable. It also has the old type of Cornish pitwork, with plunger set-offs, with, of course, extra guides and rubbing boards, which means extra friction. It is not reasonable to suppose that the old Cornish type with eight plungers can have a greater efficiency than the new type with only three plungers, and the latest design of straight-line pitwork. The additional cylinder on the compound Cornish engine will absorb some power through friction, but this will be small compared with the amount absorbed in the pitwork. The above efficiency is what is known as the mechanical efficiency of the engine and pumps, and it is an extremely good engine, built and erected with the greatest of care, that can show an efficiency of 85%. The fact of having a plunger slightly out of line, necessitating a tight gland to prevent leakage, will

make an appreciable difference in the mechanical efficiency.

Not much value can be placed on the coal-consumption figures mentioned, as they are only approximate, no coal being weighed. It is not good practice to take the duty of an engine on the basis of foot-pounds of work done per 112 lb. of coal used. It gives no information as to the efficiency of an engine, as it not only takes into account the evaporative efficiency of the boilers, but also the loss through radiation and leakage of steam-pipes, etc. Commercially it is correct, as it gives the work done for so much coal burned, but every engineer should endeavor to split up each portion of his plant, and find out in what particular part the losses are occurring. In order to get a proper and true test of the efficiency of an engine,

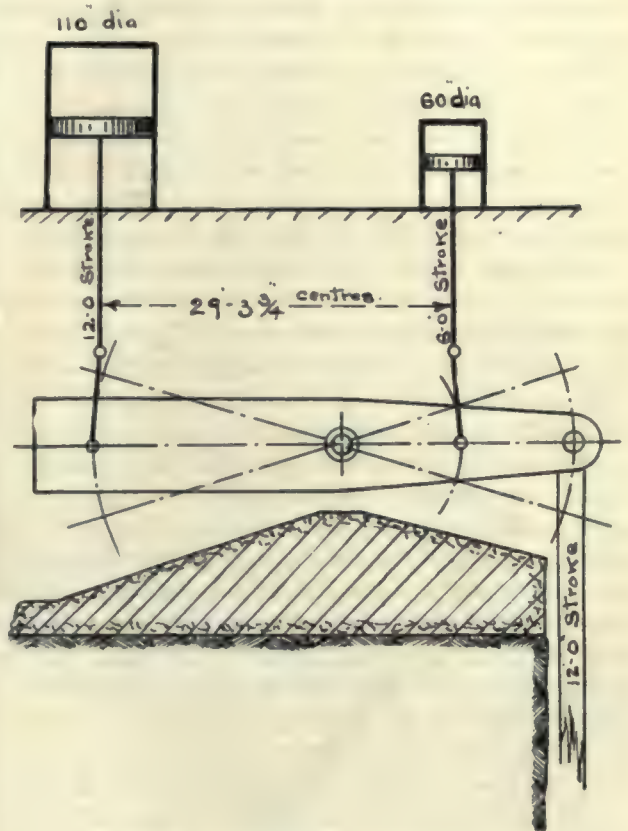


Fig. 6.—Compound Cornish Engine.

the best method is to take the duty on 1000 lb. of steam, that is, the number of foot-pounds of work done per 1000 lb. (or any number agreed upon) of steam passing through the engine. The indicator cards taken from the Cornish engine, and reproduced in Mr. Collins' article, call for no comment, but not so the cards from the compound Cornish engine. It is at once evident that the valve-gear of the compound engine needs adjusting. The absence of compression, so advantageous in raising the steam in the clearance spaces to the initial pressure, is most marked. The action of the valves which are controlled by the differential gear is not as it should be. The vacuum, so beneficial to a Cornish engine, is also poor. This engine is obviously working with a light load, while the Cornish engine is fully loaded. Taking the above points into consideration, it is not reasonable to compare the performances of the two engines. My experience of the compound Cornish engines, and I may say I have under my supervision three of them, in-

cluding the largest yet built, is exactly the opposite to that of Mr. Collins. They are without doubt considerably more economical than the ordinary Cornish type.

In 1900 I had the opportunity of testing the compound Cornish engine at the Basset mines, in Cornwall, comparing the figures with an 80-in. Cornish engine on the same mine, the result being enormously in favor of the compound type. For the same work done, about one half of the amount of coal was used. Part of this enormous saving must, of course, be credited to the greater evaporative efficiency of the new boiler plant, but by far the greater amount was due to the lower steam-consumption of the compound type. The accompanying diagrams were taken from the large compound Cornish engine at the Waihi mine, the largest of this type yet built. The dimensions of this engine are as follows: high-pressure cylinder, 60 in. diam. by 6 ft. stroke; low-pressure cylinder, 110 in. diam. by 12 ft. stroke; plungers, 23 in. diam. by 12 ft. stroke; total lift at the time cards were taken 1010 ft.; steam-pressure, 150 lb. per sq. in.; speed of engine at time cards were taken, 6 strokes per minute. Fig. 1, 2, 3, and 4 are indicator cards taken November 1908, and give the horse-power generated at each end of the two cylinders, a total indicated horse-power of 469. The water horse-power is 389, and the mechanical efficiency is $\frac{389 \times 100}{469} = 82.9\%$. Fig. 5 shows these four cards combined, all on one common scale, and is reproduced for the sake of illustrating the steam distribution in a compound Cornish engine. It is not a correct diagram of the work done; in order to get this, the low-pressure cards must be multiplied by 6.7, which is the ratio between the high-pressure and low-pressure cylinders. The parts shown in black indicate the losses during the cycle of operations. It will be observed that there is a fairly large loss, owing to excessive compression in the high-pressure cylinder, and the same applies to a smaller extent in the low-pressure cylinder. This is due to the engine being slightly out of balance when these cards were taken. By increasing the balance-weight, and thereby reducing the compression, the mechanical efficiency would be greater, and the losses less. A certain amount of compression is distinctly advantageous, as it raises the steam-pressure in the clearance space and reduces initial condensation. The drop in steam-pressure between the top and bottom of the high-pressure and low-pressure cylinders is not great, the drop between the two cylinders being larger. This engine will later on be fitted with a wiper cut-off gear on the low-pressure cylinder, so as to more nearly equalize the work done in the two cylinders. Calculating on the same bases as Mr. Collins, namely, an evaporation of 8.5 lb. of water per pound of fuel, the duty of this engine is 108,000,000 foot-pounds.

Fig. 6 is a line diagram illustrating the general arrangement of the engine. The high-pressure and low-pressure cylinders are on either side of the main gudgeon, and the pump-rods, which are 24 in. square at the surface, at the high-pressure end. This construction reduces the stress, as only a portion of the work has to go through the centre of the beam. The cylinders being some distance apart, it is economical to

place a re-heater, supplied with steam at boiler pressure, between them.

In the smaller sizes of engine the two cylinders are placed together at the end of the beam, opposite to the pump-rod. This puts more stress on the beam, but tends to reduce steam consumption. The compound Cornish engine is particularly adapted to metalliferous mines, where shafts are usually smaller than in coal mines, and where two rods would occupy too much space.

In the engine above described it will be observed that the number of expansions is about twelve, as compared with four in the ordinary Cornish type. The following are a few advantages of the compound Cornish engine over the single-cylinder Cornish type: (1) Ability to use high-pressure steam, with its resultant economies. (2) The initial strain is reduced, being only about 1.3 times the mean, as compared with twice the mean in the old Cornish type, and this notwithstanding the large number of expansions. (3) The cost of the engine per horse-power does not exceed the single-cylinder type. The water-load is about 30 lb. per square inch, as compared with about 16 to 20 lb. in the older type. A compound Cornish engine at the Waihi mine having a low-pressure cylinder 70 in. diam. by 8 ft. stroke and high-pressure cylinder 35 in. diam. by 6½ ft. stroke, with pump-cylinder 16½ in. diam. by 10 ft. stroke, is working with a water-load of 31 lb. per square inch and running at 8½ strokes per minute. (4) Ability to employ larger units. A single-cylinder Cornish engine of the same horse-power as the large Waihi engine would require a cylinder of about 135 in. diam by 12 ft. stroke, which would present great difficulties in casting.

In conclusion, it is obvious that the advantages of the compound Cornish engine over the ordinary Cornish type are so great that everything points to the adoption of the compound engine where it is intended to use the Cornish cycle, or where, through want of room in a shaft, it is only possible to have a single line of pump-rods.

Utah contains important coal reserves. The areas known to contain workable beds are estimated by M. R. Campbell, of the U. S. Geological Survey, to aggregate 13,130 sq. m., and there are in addition 2000 sq. m. of which little is known, but which may contain workable beds. The original contents of these fields are estimated by Mr. Campbell to have been 196,458,000,000 short tons. The first production of coal in Utah was reported in the census year 1870, when 5800 tons were mined. The output exceeded 1,000,000 tons for the first time in 1900, and reached its maximum of 1,947,607 tons in 1907. The total production since mining began in 1870 to the close of 1908 has amounted to 20,683,974 short tons. On the basis of one-half ton of coal wasted for every ton of coal mined and marketed, the exhaustion during this period has amounted approximately to 31,000,000 short tons, or 0.016% of the original supply.

The Gwendollin mining concession, owned by Jardine, Matheson & Co., in Korea, is being developed with success. A stamp-mill is being operated.

VACUUM SLIME-FILTERS AT GOLDFIELD.

Written for the MINING AND SCIENTIFIC PRESS
By ALFRED MERRITT SMITH.

The Butters vacuum filter plant at the Nevada Goldfield Reduction Co.'s mill at Goldfield, Nevada, is one of the earlier installations, and various methods of operation have been tried during the last four years, with a view to securing the most economical results. At the time the filter plant was installed it was not deemed practicable to erect the 'semi-gravity' type, whereby the stock-pulp is gravitated into and out of the filter-boxes as required from pulp-tanks placed respectively above and below the filter-boxes. The mill is situated on level ground, hence the filter-boxes were elevated quite high in order to secure sufficient dump-room for future accumulation of slime residues. About 12 ft. below the level of the filter-boxes is placed the one stock-pulp tank required, from which the pulp is pumped directly to and from the filter-boxes. The pumping is accomplished by a 6-in. Butters centrifugal pump, provided with the usual arrangement of valves for reversing the operation. The vacuum-pumps are two in number, of the Smith-Vaile 10 by 10-in. single type, and the working vacuum varies from 15 to 25 in. The filter-boxes are three in number, having 15 leaves each, 45 in all. Leaves of a special design by E. S. Leaver have been in use for over three years, the essential difference from the Butters leaves being that grooved wooden slats are used as a filling for the canvas leaf, instead of the canvas being sewed upon a cocoa matting filler.

Assuming general familiarity with the operation of vacuum slime-filters of the modern type, I will briefly describe the evolution of our filter work here to the present stage. It is known in milling circles where slime-filters of the Butters make have been adopted, that there is a continual enrichment of the wash water, or wash solution, by osmosis, which in the filtration of high-grade slime will result in material losses of gold. For example, the cakes having been formed on the leaves and the excess pulp returned to its tank, clean water is pumped or gravitated into the filter-boxes for washing, and the vacuum again applied to draw wash water through the cakes. But this clean water, coming into contact with the comparatively large area of slime cake, pregnant with gold solution, immediately absorbs and diffuses a portion of the gold and cyanide. After the required amount of this wash water has been drawn through the cakes by means of the applied vacuum, the excess of 'wash' is run back to a tank, to be used again for the same purpose, carrying with it an increment of gold and cyanide. This gold and cyanide in the wash is cumulative, increasing with each cycle of operation. The quantity of water necessary to replace that which is drawn through the leaves, and also that which is discharged with the residue in ordinary work, is not sufficient to prevent a gradual enrichment of the reserved wash.

It was our early practice here, when the wash water had increased in assay value from nothing to about \$1.50 or \$1.75 per ton, to discharge the whole

of it into the battery solution tanks. As the original crushing is done in cyanide solution, this provided a way to save a part of the loss. A fresh supply of clean water was then taken in for filter wash. This, however, did not save the cyanide and gold remaining in the wash water which was necessary to run out the slime-residue, amounting to several cents per ton of dry slime in treating the high-grade ores of Goldfield. Double washing was next tried. The cakes were first thoroughly washed with weak barren sump-solution, the whole of the excess wash being returned to a separate tank. The boxes were re-filled with clean water, the vacuum applied for five minutes, to re-wash slightly, the cakes were dropped, and the excess of water returned to the water tank, enough water being retained to discharge the residue in the usual way. In theory this method seems almost perfect, as the loss of gold by osmosis is reduced to almost nothing, and the volume of working mill-solution is not materially increased by an additional five-minute water wash. The objections were, first, a double exposure to the air and the washing action, frequently causes much of the cake to loosen and drop off from the leaves prematurely, and second, more time and pumping is necessary to complete a cycle of operations. The first of these objections is not serious, as it cannot overcome the primary object, that is, the prevention of gold loss by osmosis, for this is obtained by saving all of the first wash solution, none of which is used to sluice out the residue.

The method now in use, which allows the filters to be worked at their full capacity, and at the same time minimizes the loss by osmosis, is as follows: The cakes being formed and the stock pulp returned, the boxes are filled with weak barren sump-solution and sufficiently washed. When the wash is completed, an excess of wash-solution is pumped back to a storage tank, enough being retained to flush out the residue. The discharged residue is run into a tailing dam, settled, and clear solution is drawn off by means of a gate or weir, to a pit, from which it is pumped back to the mill, to be used again as filter wash or as battery solution. Clean water is run into the residue pond to the amount of fifteen or twenty thousand gallons per day, as a further wash and to absorb and save a portion of the gold-bearing solution which remains in the residue. This water is returned to the mill, and is ordinarily sufficient in quantity to preserve the equilibrium of the mill solutions.

Below is a sample copy of the record kept for each filter-box charge, showing the distribution of time in a complete cycle:

| Charge No. 4987. | | June 4, 1909. | | |
|-------------------------------------|---------|---------------|------|----|
| Filter-box No. 2. | A.M. | Hr. | Min. | |
| Filling filter-box with stock pulp. | 6:52 to | 7:13 | | 21 |
| Period vacuum applied | 7:13 " | 8:18 | 1 | 5 |
| Pumping back excess pulp..... | 8:18 " | 8:35 | | 17 |
| Pumping on wash solution..... | 8:37 " | 9:00 | | 23 |
| Time washing | 9:00 " | 10:00 | 1 | |
| Dropping cakes | 10:00 " | 10:07 | | 7 |
| Pumping back wash | 10:07 " | 10:22 | | 15 |
| Discharging residue | 10:22 " | 10:27 | | 5 |
| Total time of cycle..... | | 3 hr. 33 min. | | |
| Tons of solution from pulp..... | | 4.53 | | |
| Tons of wash through cakes..... | | 3.05 | | |
| Thickness of cakes..... | | 1 in. | | |
| Specific gravity of stock pulp.... | | 1.21 | | |

PELLEY, ROSS, AND GRAVEL RIVERS.

By J. KEELE.

*The country through which the Yukon river and lower portion of the Pelly river flow appears to be a dissected plateau. An originally low rolling country has been elevated to a height of about 4000 ft. above sea-level, and carved by stream action into a series of long, gently sloping ridges or dome-shaped hills, whose summits may be remnants of the original plateau. Following the Pelly river eastward, these hills become higher, and merge into mountains more or less rugged, with crests standing at a much higher elevation than the plateau region; from 6000 to 7000 ft. above sea-level. These mountains extend eastward to within 40 miles of the Mackenzie, and are then flanked by a narrow belt of foothills, which gradually decline in elevation until a fairly level plain is reached, standing at an elevation of about 600 ft. above sea-level.

The western plateau region is underlain by what are generally regarded as the oldest rocks of the region. These consist chiefly of various crystalline schists, of both sedimentary and igneous origin; but also contain a subordinate quantity of later intrusive rocks, including granites, diorites, and andesites, which generally still retain their massive character. The heterogeneous character of the rocks included within the mountain province precludes any lengthy description. Briefly, those on Ross river consist chiefly of sedimentary rocks, including slates, cherts, and quartzites, together with a few small intrusive bodies of granite, diorite, and andesite; while those on the Gravel river consist of sandstones, limestones, dolomite, and conglomerate. Intrusives are seldom seen. The plain lying east of the foothills, and bordering Mackenzie river, is underlain by soft sandstone and conglomerates, probably of Cretaceous age.

Prospecting for gold began on Pelly river as early as 1882. For some years subsequent, miners working on the gravel bars made as much as \$10 to \$20 per day, their operations being confined to the lower portion of the river. Since then prospecting has been carried on along the greater part of the river and many of its tributaries, but no mining of importance has yet been done in the region. Fine colors of gold are found in the gravels over a large area, but no coarse gold has yet been discovered. For the last few years work in the district has been confined to the streams entering the Pelly from the south, between Lapie and Hoole rivers. These streams head in a high range lying south of and parallel to the course of the Pelly. Along the base of these mountains lies a wide valley, floored with gravel and containing several lakes. This valley is separated from the Pelly river by a line of rocky hills, through which the streams have cut channels. The gravels of the valley contain fine and coarse colors of gold, and a portion of the gold, concentrated from them, is caught in the bedrock in the lower portions of the streams tributary to the Pelly. The Stewart River region, to the north of the Pelly, resembles the country in the

vicinity of the latter, in many respects. Coarse gold was found in that region about ten years ago, and almost every year since then discoveries of more or less importance have been made. Two serious difficulties, however, hard to overcome, prevent the Stewart River country from becoming a successful mining camp. These are underground water and lack of adequate transportation to ensure a supply of provisions for miners all the year round. The same difficulties apply to the Pelly River country. A good deal of rich ground which could be worked by the open-cut method was mined in the Stewart country, but individual miners have never succeeded in deep digging where underground water occurred abundantly. At least two parties of miners, and probably more, have prospected of late years on the Ross river, but without success. Charles Wilson, who has prospected on the upper portion of the river during the last two years, got colors of gold in one small creek which flows into the south branch of the MacMilan river, but found no coarse gold. My experience corroborates these statements. It is possible that coarse gold may exist on bedrock on either the Ross or Gravel rivers, or their tributaries, but the apparent absence of fine gold in the gravels tends to discourage any hope of it being found there. A fact, frequently commented on by men who accompanied me, was the marked absence of quartz, either in the bedrock or the wash gravels, along the route traveled from the Pelly to the Mackenzie.

There appears to be a close connection in the Yukon Territory between the crystalline schists and the placer deposits. In the Pelly valley these rocks appear to occupy a belt extending for a distance of about 10 miles on each side of the river, which flows generally parallel to the strike. In the vicinity of Campbell creek, however, the Pelly river turns northeastward, while the belt of crystalline schists continues southeastward to the Francis river. Fine gold is found in the gravels all along the Pelly, from Campbell creek to the Yukon, while none is found above that point on the river. Small veins and stringers of quartz are abundant in the schist, and quartz pebbles form a considerable percentage of the wash gravels along the Pelly. Mr. Henderson tested a few bars on the Pelly, at and above Hoole canyon, using two sluice-boxes about 12 ft. long. He saved for me several pounds of the black sand which accompanied the gold. A grayish white malleable mineral in small scales, which I thought might be platinum, is abundant in this sand. The sample was submitted to Robert Johnston, mineralogist to the Survey, who states it to be ferro-nickel, a rare mineral, but of no commercial value in such small quantities. The bulk of the black sand is composed of magnetite and garnet.

Quantities of drift lignite are found along the lower part of Campbell creek, but the seams from which it is derived were not found. There is probably a small Cretaceous area lying on the schists in this vicinity, similar to the one on the Pelly some distance below Ross river. Drift lignite is found along Gravel river where it enters the plain bordering the Mackenzie, and which is no doubt derived from seams in the adjacent Cretaceous.

*Abstracted from Summary Report, Geological Survey Branch, Department of Mines, Canada, 1908.

ALASKA SURVEYS NOW UNDER WAY.

All the Alaskan field parties of the U. S. Geological Survey are now at work or on their way to the interior. The surveys and investigations of 1909 include 14 parties, which are widely distributed over Alaska. These parties comprise 12 geologists, 7 topographers, and 3 engineers. The surveys are carried on under the direction of Alfred H. Brooks, who left Seattle for Cordova on the first of July. From Cordova he will proceed up Copper river and make a brief visit to the Nizina district. Circumstances permitting, he will then go by overland trail to Fairbanks, and later will pay a visit to the Berners Bay and Eagle River districts, in southeastern Alaska.

Adolph Knopf, geologist, began work in the Berners Bay region on May 19, studying the geology and ore deposits in detail. On the completion of this work he will start for Eagle river, and will there begin work on a similar investigation. J. W. Bagley, with one assistant, is making a detailed topographic survey of the Eagle River mining district.

At the close of last year the general investigation of the two copper belts of the Copper River region was completed, and it now remains to make a more detailed study of the regions of present greatest economic importance. The area first to be investigated lies at the east end of the Chitina-Kotsina belt. This field not only affords the best exposures, but is also the region where greatest depth has been reached in developing the orebodies; hence it will yield more facts than other parts of the district, and has therefore been chosen for first investigation. F. H. Moffitt and S. R. Capps, who are to do this work, reached Valdez June 1 and reported a heavy fall of snow in the pass, which delayed them. They are now on their way to the interior.

U. S. Grant and D. F. Higgins sailed from Seattle on June 8 for Seward, where they will begin a reconnaissance of the eastern part of Kenai peninsula. Much prospecting has been done in this field during the last few years. It is expected that Mr. Grant will be able to complete the preliminary examination of the entire southeastern and southern coast line of the Kenai peninsula.

The policy of mapping the Alaskan coalfields in detail will be continued in the Matanuska field this season. R. H. Sargent, with one assistant topographer, began work about the middle of June. This force will be divided into two parties. Mr. Sargent's task will be to make a detailed topographic map of the most important part of the Matanuska coalfield, which will serve as a base map for special geologic investigations during 1910.

West of Cook inlet is a large unsurveyed tract in which, it is reported, there have been discoveries of copper lode deposits and placer gold. The Geological Survey this year despatched a double party to begin the survey of this extensive area. This party is in charge of D. C. Witherspoon, topographer, with whom is associated G. C. Martin, geologist. The party landed at Iliamna bay May 14. F. J. Katz will assist in the geologic work and C. E. Giffin in the topographic survey.

The extensive area lying between the Yukon and

Tanana has been the subject of investigation for several years. A reconnaissance map of this area is now completed, and much of the geologic work has also been done, but a considerable tract still remains to be covered. This work is being continued by L. M. Prindle, assisted by B. L. Johnson. The party will land at Circle about the middle of June and go southward, reaching Fairbanks about the first of August. Thence a trip will be made to the region southeast of Fairbanks, and later in the year the work will be extended into the area northwest of Fairbanks. The investigation of the surface water supply needed for placer mining in this field was begun in 1907, and as it is necessary to obtain records of stream-flow for a number of years before any generalizations can be made as to the run-off, these investigations have been continued this year. C. E. Ellsworth, who was detailed to this work, reached Fairbanks over the trail about the first of April, and has since been engaged in stream measurements in the Fairbanks, Baker, and Rampart districts. The first survey of the Chandlar and Koyukuk districts was made in 1899 by F. C. Schrader and T. G. Gerdine. That was the summer in which gold was discovered in this field. Since that time the Koyukuk district has been a continued producer in a small way, but in 1907 more valuable placers were found there, and some workable placers were found in the Chandlar district. This fact led to a demand for further work in this field, which is being carried on by A. G. Maddern. Mr. Maddern will reach the Chandlar district in the early part of July, and later will make his way overland to the Koyukuk district.

Between the lower Koyukuk and Seward Peninsula there is a belt about 150 miles wide which is practically unexplored. It is possible that this area may contain deposits of gold and coal. With the view of obtaining information on this point, P. S. Smith, assisted by H. M. Eakin, is carrying on an exploratory survey westward from Nulato to Norton bay, and thence to Council.

The Geological Survey has done more work in Seward Peninsula than in any other part of Alaska. The entire field has been covered by geologic and topographic reconnaissance maps, and some of the more important areas have been mapped in detail. In addition to this, special reports have been published on the tin deposits and on the gold placers. Investigation of the water resources—an important feature to the placer miner—was begun in 1906. This work is being continued through another year. F. F. Henshaw, assisted by G. L. Parker, is expected to reach Nome about the middle of June.

The North Lyell, in Tasmania, is developing into one of the richest copper mines in the world. Last half-year closed with an addition to the ore reserves of 169,121 tons, making 710,333 tons blocked out and ready for stoping, and the ore contains 6% copper.

A mining concession has been granted an Italian company in the district of Huchang in North Pyongan, Korea. Reports from Seoul are to the effect that some valuable deposits have been developed recently.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINING CLAIMS—APEXING VEINS.

The owner of a lode mining claim has the right to the ore beneath the surface of his claim in a vein not having its apex there, subject only to the right of the owner of the claim where such vein apexes to follow it downward on its dip.

Mammoth Mining Co. v. Grand Central Mining Co.,
29 Sup. Ct. Rep. 413, March '09.

FAILURE TO MARK BOUNDARIES OF MINING CLAIM.

When the purchaser of a mining claim took it without defined boundaries, and during the continuance of his claim erected no monuments or corner posts, so that the boundary lines of his claim could be readily traced, he assumed at his own peril the risk of intervening rights of third persons.

Protective Mining Co. v. Forest City Mining Co.,
(Wash.) 99 Pac. 1033, Feb. '09.

OIL AND GAS LEASE—CONSIDERATION.

A lease for oil and gas, for a money bonus as consideration, did not bind the lessee to drill for oil or gas or pay money in lieu of doing so; but it left it optional with him to do so or not. The lessor in such a lease could not annul or revoke it merely on the ground of want of mutuality.

Pyle v. Henderson, (W. Va.) 63 Southeast, 762,
Jan. '09.

DEFECTIVE LOCATION NOTICE GIVES COLOR OF TITLE.

Where in an action to quiet title to a mining claim against a prior location, a discovery was not proved, a defective location notice was held a sufficient color of title, when coupled with possession gained under a peaceful entry, to warrant a recovery, and where it appeared that the defendant had no legal rights in the disputed ground.

Protective Mining Co. v. Forest City Mining Co.,
(Wash.) 99 Pac. 1033, Feb. '09.

EFFECT OF DISCOVERY BEFORE NOTICE OF LOCATION.

The fact that mineral is not discovered on a claim until after the notice of location is posted, and the boundary marked, is immaterial, where there have been no intervening rights, and where the discovery is the result of work subsequently done by the locator, his possessory rights under his location are complete from the date of such discovery.

Protective Mining Co. v. Forest City Mining Co.,
(Wash.) 99 Pac. 1033, Feb. '09.

MINING CLAIM—QUIETING TITLE.

A person seeking to quiet title to a mining claim against a prior locator is not required to allege that he had actually discovered minerals on the claim; nor is he required to excuse the absence of such allegations by alleging that his location notices showed that his act was a re-location of abandoned ground. In such case it is sufficient to allege ownership and possession and the adverse claim of the defendant.

Protective Mining Co. v. Forest City Mining Co.,
(Wash.) 99 Pac. 1033, Feb. '09.

APPROPRIATION OF LAND BY A RAILROAD—RIGHT OF OWNER OF MINERALS.

A railroad company appropriating land for its right of way or other purposes secures not only the surface, but also so much of the underlying minerals as may be necessary to properly support the surface for its use. And where the owner of the surface had prior to such appropriation by the railroad, conveyed the underlying coal with sufficient mining rights to enable the grantee to remove it, regardless of its effect upon the surface, such grantee was entitled to be compensated by the railroad company for any part of the coal necessary for the support of the surface.

Diltz v. Plumville R. Co., (Pa.) Atl. 1072, Jan. '09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

GEOLOGY OF THE DISSEMINATED LEAD DEPOSITS OF ST. FRANCOIS AND WASHINGTON COUNTIES. By E. R. Buckley. Missouri Bureau Geol. and Mines. Vol. 10, pt. 1, pp. 259, pt. 2, Atlas. Jefferson City, 1909.

This, Mr. Buckley's final report for the Survey of which he was sometime director, treats of one of the most important mining areas in the United States. The work is based upon studies extending intermittently from 1903 to 1908. It presents in great detail, by means of maps and sketches, the mode of occurrence of the ores, including the baryta near Potosi. The maps will attract attention, especially because of the large number of fault lines which have for the first time been traced out. Mr. Buckley refers the deposits genetically to the descensional class, and believes them to have been formed through the action of ground-water in part derived direct from the surface and in part finding its way into the Bonnetterre limestone from the La Motte sandstone below.

EL PASO FOLIO. By G. B. Richardson. U. S. Geological Survey, Washington, 1909. Price 25 cents.

To mining men the principal point of interest in this folio will be the portion discussing the tin deposits of the Franklin mountains. According to Mr. Richardson, present developments do not warrant prediction. The chief question concerns the abundance of ore which, as he sensibly remarks, can only be determined by further work. "Conditions, however," he states, "appear to warrant intelligently directed development, and the entire granite outcrop might well be prospected for new occurrences of tin ore." The excellent map and the text of the folio will be of great service to any one undertaking this work.

Catalogues Received.

The BLAISDELL Co., Los Angeles, Cal., has just issued its Catalogue K, describing the Blaisdell patent vacuum filter leaf.

The JEFFREY MFG. Co., Columbus, Ohio, has recently published Bulletin No. 23, describing its propeller fan for mine ventilation and 'boosting'.

The NEW YORK ENGINEERING Co., New York, has lately published a pamphlet on the Empire Hand Prospecting Drill for prospecting placer ground. It will be sent to anyone interested.

The HENDRYX CYANIDE MACHINERY Co., Denver, Colo., has just published its Catalogue No. 6, which describes and illustrates the testing works of, and different machinery carried by, this concern.

The C. O. BARTLETT & SNOW Co., Cleveland, Ohio, in its Catalogue No. 30, just from the press, gives 130 pages of illustrations of machines made by the company, and also numerous installations of all sorts.

The WESTERN ENGINEERING & CONSTRUCTION Co., San Francisco, Pacific Coast agent for the Robins Conveying Belt Co., is distributing the latter's Bulletin No. 20, on the subject of 'Hoisting and Conveying Machinery for Power Stations'. They will be glad to send it to anyone interested.

Mica.

The total value of the mica produced in the United States in 1908, according to statistics compiled by D. B. Sterrett for the United States Geological Survey, amounted to \$267,925. The production of sheet mica amounted to 972,964 lb., valued at \$234,021, a decrease of 87,218 lb., and \$115,290 from 1907. The production of scrap mica amounted to 2417 short tons, valued at \$33,904, a decrease of 608 tons and \$8896. The value of the imports into the United States fell from \$925,259 in 1907 to \$266,058 in 1908, or slightly less than the domestic production. The mica produced came from ten States, the most important of which, named in the order of the value of production, were North Carolina, South Dakota, Colorado, Alabama, and Virginia.

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TABLE OF CONTENTS.

| EDITORIAL: | Page. |
|---|-------|
| Notes | 69 |
| Copper Prices and Production | 70 |
| Mexican Mining Law | 71 |
| GENERAL MINING NEWS | 73 |
| SPECIAL CORRESPONDENCE | 78 |
| CONCENTRATES | 84 |
| DISCUSSION: | |
| Co-Operative Topographic Surveys..... | |
|Richard R. Hice, I. C. White | 85 |
| Cost Sheet for Mines.....Algernon Del Mar | 86 |
| Progress in Cyanidation.....George Mackenzie | 86 |
| ARTICLES: | |
| Virginia Geological Survey for the Season 1909.... | 87 |
| Phosphate Deposits of United States..... | |
|Frank B. Van Horn | 88 |
| Manganese in the United States..... | 90 |
| Historical Geology of California.....William Forstner | 91 |
| Does an Australian Kimberley Exist?..... | |
|John Plummer | 93 |
| Gunnison County, Colorado, Minerals..... | 94 |
| Drill-Log for Placer Ground...William H. Radford | 94 |
| Engineering Responsibility.....Charles B. Dudley | 95 |
| Change of Method in Mining Soft Ore..... | |
|Stuart Rhett Elliott | 97 |
| Mexican Mining Law..... | 99 |
| Hydraulic Mine Equipment for Panama..... | 99 |
| Coal in Washington in 1908..... | 100 |
| DEPARTMENTS: | |
| Personal | 72 |
| Obituary | 72 |
| Market Reports | 72 |
| Publications Received | 100 |
| Commercial Paragraphs | 100 |

EDITORIAL.

SURVEYS have been completed for the projected railroad from Toluca, in the State of Guerrero, Mexico, down the canyon of the Balsas river to the Pacific. A region reputed to contain large veins of gold-bearing pyrite with moderate amounts of copper would be opened by this line. Mr. G. T. Shaw, the chief engineer, states that the enterprise is in the hands of British capitalists who are identified with the Popo Packing Company.

CONSERVATION is not attracting attention in America only. At a recent meeting of the Faraday Society in London, Mr. E. R. Taylor presented the subject of conservation of water power from the American standpoint. In the discussion the advanced position of Germany was pointed out, as also the many difficulties to be met in Great Britain as a result of the high cost of land. The subject is one requiring much study, but evidently, if we are to profit by our neighbor's mistakes, there should be also some action.

DEATH has taken from us one of our special contributors, Mr. John A. Reid. He was one of the younger men of our staff, but one whose loss we shall feel keenly. A man of charming personality and sterling character, with a passion for service and a genius for friendship, well trained, and with high ideals of professional conduct, he was of the type of American mining engineer of whom we are all proud. Standing as he did at the threshold of an apparently successful professional career, he could ill be spared, but his example remains—that of one who looked well to his foundations, and did his work manfully to the last.

HONOR is due the brave men who explored the West and laid the foundation of the present development of its resources. Among these hardy pioneers, the one-armed veteran of the Civil War, Major J. W. Powell, was a leader. He was a scientific observer and kept the great problems always in mind. He devoted his life to science and his country, and died poor. It is a peculiar pleasure to know that the proposal to erect a monument to him by public subscription has met with instant and popular approval, and that the committee in charge is receiving a large number of small checks. We hope there will be many more, as the lesson of such a monument lies as much in the popular response as in the life of the man honored.

CONVENTIONS are a feature of American life, and the season for these summer gatherings is almost here. The Irrigation Congress will meet at Spokane from August 9 to 14, and the Trans-Mississippi Commercial Congress at Denver from August 16 to 21. In September the American Institute of

Mining Engineers will visit Butte, Spokane, Seattle, and Tacoma, continuing their trip into October in order to stop at Salt Lake. The Mining Congress at Goldfield, October 11 to 16, will close the list of those in which mining men have special interest. These meetings bring out much helpful and stimulating discussion, and it cannot be doubted that the country at large is benefited. Perhaps the larger benefit to those taking part arises from the broader acquaintance acquired with regions and men.

JOKING has often proved dangerous. Mr. James Taylor, one of the State Mine Inspectors of Illinois, has now found it so. While on a visit to Pennsylvania he told the oft-repeated story of the Miners' Committee which waited on the mine manager and wanted him to measure the air. Being told that he could not do so because the company had failed to furnish an anemometer, they went to the company's office and threatened a strike if an 'automobile' were not furnished the boss. It seems that the humor of this story is not appreciated by the miners of Pennsylvania.

SOUTH AMERICA is being brought steadily into closer relations with the United States. A direct line of steamers has been put in service between New Orleans and Buenos Aires. The new Peruvian line to Panama shortens the time from Lima to New York and San Francisco, and it is announced that a great bank, endorsed and facilitated by the Administration, is being formed to encourage trade between this and South American countries. The immediate returns on the capital of such a bank are not likely to be large, but the incidental profits should be satisfactory. The bank will stimulate the development of new industry. The existing producers in every department of activity, mining and agricultural, are bound to the old established export houses by long extensions of credit. Participation in this old business is impossible. The new bank will find its opportunity in the opening of new territory by railroads and irrigation projects, and in the underwriting of securities for the development of mining enterprises. Such expansion naturally will call into existence a new crop of middle-men, free to make commercial alliances independent of the old régime. To make such operations effective ample steamship service is requisite; this brings up anew the everlasting question of a shipping bill which will enable this country to hold its own against foreign subsidized fleets.

COMPETITION in Manchuria is intense. We are assured on the one hand that Fushun coal, produced, by the way, in the Japanese zone of influence, is "the best steaming coal in the Far East." Equally positive declaration is, however, made that the Kaiping coal, mined by an Anglo-Chinese company, "is superior to any being mined in the Far East," and there has been much diplomatic discussion regarding the true status of the Fushun mines. All this means merely that two railway companies are contesting for traffic. The Chinese Eastern has put in reduced rates from Mukden to Vladivostok on beans, the principal article of export. The South Manchurian railway still hauls the bulk of the crop to Dairen,

and is accused of discriminating against Niuchang. The particular discrimination charged bears a family resemblance to our Spokane rate case. The defense is that Dairen is an ice-free port, and that the real objections come from owners of warehouses for winter storage at Niuchang, who see a profitable business rapidly disappearing. The difficulty is to be met, it is announced, by the Chinese opening a new ice-free port in Lien Shan, Gulf of Pechili, about 200 miles north of Shanhaikwan. These moves and counter-moves on the part of Russians, Japanese, and Chinese emphasize the fact that the controversies are founded, after all, on economic causes and are not unlike our own troubles between rival cities and ports. It is well to cultivate a certain calmness in discussing 'outrages' in the Far East.

Copper Prices and Production.

Copper continues a mystery. Not even by the entrails of a fowl does any oracle venture to predict the future. The plain pragmatist of the street is sure he has not been favored with a view either of the 'insides' of the market or of the oracular chicken. We know who buys the gold and the silver, the iron, the lead, and the zinc, but to all query as to whither goes copper no answer comes. Concerning the hereafter and copper the Sphinx is silent. And, incidentally, who is the Sphinx—especially the copper Sphinx, that can seal the lips that so many would smite to speech? The Copper Producers' Association issues statistics that give non-committal summaries. The smelter output for May was the largest on record. It reached 118,300,000 pounds. In June it was but little less. The domestic stock has decreased, while the visible increase abroad was about 22,000,000 pounds. The consumption, however, is not ascertainable except by those who are close to the market. The openness so characteristic of transactions in other materials does not apply to copper. But the great smelters continue not only to produce but to prepare for a heavier output; dividends are being paid; and new copper mines are being developed and equipped. This can only mean that the plight of the copper smelters is not as difficult as it seemed a month or two ago. It seems probable that the consumption of copper has actually been greater than had been generally assumed. The high prices quoted at the summit of the boom were mere exaggerations. The junta that fixes prices on the metal exchange could publish pretty figures, but the buyer held aloof. It has been affirmed by leading independent copper producers that insignificant deliveries were made at a higher price than 22 cents per pound. The high price prevented accumulations of stocks abroad, but great quantities were carried in this country. The public entertains the impression that copper must command about 15 cents to be distinctly profitable. As a matter of fact, in the last twenty years the average has reached 15 cents only seven times. During the other thirteen years the average price was 11.96 cents per pound. The average American production during that period was 257,527 tons per annum, whereas the amount in 1906 was 409,414, and in 1908, which is conceded by Messrs. Aron Hirsch & Sohn to be a record year for con-

sumption, it was 408,928 tons. The increase in known copper reserves within the same period has evidently kept pace with the augmented demand. There is no reason to anticipate a marked elevation in the price; the copper miner must bend his energies toward economy; he must keep down his mining costs, and not try to smelt with small units. The day of small works, and of smelting with barren flux, is over. The demand for copper is good, and it will grow, but so will production by the mammoth corporations, and competition from South American mines, which yield precious metals in important quantities, must be met.

Mexican Mining Law.

Great excitement stirred the foreign colony in Mexico a year ago because Señor Olegario Molina, the venerable and energetic Minister of the Interior, or Fomento, as Spanish people suggestively term the office, had evolved a project for a mining law which imposed restrictions on foreign corporations. It is not peculiar to Spanish-America that politics are matters of such delicacy that the truth is passed along under the breath instead of by open speech, lest dust of difficulty be raised. This even involves the foreigner, who often talks loudly, but in circumlocution of the real point of interest. The motive behind the mining law as first proposed has never been declared, and perhaps we are bound to the same cautious treatment of what all men know who know anything of the problems confronting the Administration of the Republic today. Are there not Reyist demonstrations even now in evidence? Meanwhile President Diaz is so guiding affairs as to prevent a lapse of the onward and upward movement of Mexican development. Foreigners must be considered as well as citizens when it comes to legislation.

The new project for a mining law, of which we print the first chapter in translation elsewhere in this issue, has passed the House of Deputies, and will probably be confirmed as it stands by the Senate in September. Under it the foreigner labors under no disadvantages, except as regards a buffer zone which refers particularly to the frontier with the United States. Within that zone, as the statute runs, "Title to mining property may not be issued in favor of foreigners who denounce *pertenencias* within a zone of eighty kilometres along the dividing line with foreign countries, if they have not previously obtained special permission from the Executive of the Union. This will be required even when the denouncement be made jointly by foreigners and citizens of the nation;" and again, "Foreign corporations are incapacitated from denouncing or acquiring, by whatever title, mining properties or real estate rights in the same, within said zone." It is also provided that if a foreign corporation should stand in law entitled to such properties by virtue of inheritance or adjudication by the courts, it must transfer the same to legally competent ownership within the period of one year. This follows closely a like provision in the Federal Statutes of the United States touching mining claims within the jurisdiction of the Territories. The prohibition above mentioned applies also, under the new Mexican project

of mining law, to those not citizens of the Republic.

With these exceptions, the status of a foreign corporation is merely that of a legal person, free to hold property and transact business subject only to the municipal law and to treaty restrictions, which latter are practically nil. In effect, a foreign corporation is thus liable only to the extent of available assets within the Republic, and is taxable thereon, regardless of its capitalization. A foreign corporation accordingly enjoys advantages superior to those of companies constituted under Mexican law.

The liberality, fairness, and good sense of the Mexican Mining Law have won the encomiums of distinguished jurists in America and other countries. The unit of surface is small, consisting of one hectare, equal to 2.47 acres, but any number of hectares may be grouped for purposes of title, thus reducing the cost and inconvenience of making application for patent. Possibly the term patent should not be applied at all, since ownership in fee simple is not conceded. The right obtained by title is superior to a leasehold, and yet forfeiture is more swift and absolute than occurs from failure to pay accruing taxes on patented land. Also the previous existence of ownership does not cloud a subsequent title in the absence of a court decree, if the property has become open to denouncement. No extralateral rights accompany mining property, but the *pertenencias* may be so grouped as to cover an area that will protect the miner on the dip of his vein. The utmost facilities are granted for the economical operation of mines, the industry being declared a public utility, which opens the way to expropriation under circumstances defined by the Civil Code. No lax provisions are offered for holding claims through the performance of assessment work, which may be evaded, as is so often done in the United States. The only means for retaining control of mining property is by filing a claim and paying the requisite fees. The claim does not then lie, as a mere assertion of possession, on the books of the Mining Agency, but must be pressed forward to title within a limited period, and the prescribed fees must be paid. If an application be allowed to lapse it costs money to relocate, so that the temptation to locate great areas and hold them by fraud, as can be done in this country, is effectually dissolved. The Mexican Mining Law is at once liberal to the individual, and protective of the public interest; it prevents abuse of the National domain, and requires its economic use as the means for retaining rights therein. Even outside of the statute, the spirit of fostering the mineral industry is shown. Recently a Government subsidy was obtained for the sinking of a deep shaft to explore the veins at Guanajuato. This is a broad extension of the principle that mining is a public utility. The city of Guanajuato has much to gain through demonstration of deeply seated ore deposits; the advantage to Guanajuato would be also a gain for the Nation. It is a remarkable instance of fomenting industry through what we choose to call paternalism. Though unusual, it is no more than a logical application of the principle underlying the subsidizing of railroads and the encouragement of certain forms of effort through a protective tariff.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

S. A. WORCESTER is in Denver.

HENNER JENNINGS is in San Francisco.

F. LYNWOOD GARRISON has been in San Francisco.

H. FOSTER BAIN is visiting Nevada City, California.

JAMES H. MORAN, of Sonora, Mexico, is at Los Angeles.

R. A. F. PENROSE is expected in San Francisco shortly.

C. J. BANDMANN is examining mines in Sonora, Mexico.

D. H. PETTINGILL is at Parlier, Fresno county, California.

E. S. KING, of the Ivanhoe mine, Kalgoolie, is in London.

ROWLAND FEILDING is in Italy, inspecting alluvial deposits.

W. E. DEFTY will be at Los Angeles the next two months.

E. NESBIT is with the Grasselli Chemical Co. at Cleveland, Ohio.

ROBERT D. GRANT has returned to Los Angeles from New York.

C. B. E. DOUGLAS is at Minas del Tajo, Rosario, Sinaloa, Mexico.

EMERSON GEE has returned to Los Angeles from Sinaloa, Mexico.

ROBT. J. BONNEMORT is at the North Star mine, Kofa, Arizona.

E. M. HAMILTON is with the El Rayo M. & D. Co., Santa Barbara, Mexico.

J. H. BAKER, representing Phelps, Dodge & Co., will leave soon for Honolulu.

E. H. WEBSTER has gone to the Mina la República, Ocampo, Chihuahua, Mexico.

H. ABBOT TITCOMB has arrived in London after extended travels in the Orient.

JOHN O. NORBOM has been examining mines in Mariposa county, California.

J. V. BOHN is general superintendent for the Tennessee Copper Co., at Ducktown, Tennessee.

H. C. DAVEY, manager of the Guadalupe quicksilver mine, of Los Gatos, California, was in San Francisco.

BRAYTON P. CAMPBELL has been appointed superintendent of the Eureka-Windfall cyanide mill, at Eureka, Nevada.

CHAS. M. ROLKER is expected in California, from London, in connection with the examination of dredging ground at Folsom.

FRANK D. PAGLIUCHI and B. G. COBB have opened an office at Dawson, Y. T., to engage in mining engineering and metallurgical work.

R. B. HERGARDT, general manager for the Old Dominion Copper Co., has recently returned to Globe, Arizona, from California.

LUCIEN EATON, recently with the Iron Belt and Shore mines, is now superintendent at the Cliff shaft of the Cleveland Cliffs Iron Co., Ishpeming, Michigan.

E. H. SIMONDS has returned to San Francisco from Mazuma, Nevada, where he has been starting the new mill of the Darby Ore Reduction Company.

Obituary.

JOHN A. REID died in Stockton, California, on July 4. During the winter of 1907-8 Mr. Reid went into Lower California on professional work, and there contracted pneumonia which later developed into tuberculosis and caused his death. He was a graduate of the University of California and for some time teacher in the University of Nevada. He was a special contributor to the MINING AND SCIENTIFIC PRESS and the author of numerous bulletins and papers relating particularly to the geology of the Sierra Nevada. He was a keen observer, and while engaged in general consulting practice took time to put his observations on record for the benefit of others.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, July 15.

| | | | |
|--------------------------|------------|--------------------------|----------|
| Antimony..... | 12-12½c | Quicksilver (flask)..... | 44-44.50 |
| Electrolytic Copper..... | 15¼-16¼c | Spelter..... | 6½-7¼c |
| Pig Lead..... | 4.60-5.55c | Tin..... | 82-83¼c |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | July 8. | July 15. |
|------------------------|---------|----------------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 7 8 | 1 8 6 |
| El Oro..... | 1 7 0 | 1 5 3 ex div. |
| Esperanza..... | 2 17 6 | 2 19 6 ex div. |
| Dolores..... | 1 10 8 | 1 10 0 |
| Oroville Dredging..... | 0 13 6 | 0 13 0 |
| Mexico Mines..... | 6 3 9 | 5 18 9 ex div. |
| Tomboy..... | 1 2 6 | 1 2 0 ex div. |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

July 15.

| | July 15. | | Closing Prices. |
|--------------------------|----------|---------------------------|-----------------|
| | | | July 15. |
| Adventure..... | 6¼ | Mohawk..... | 58½ |
| Allouez..... | 40 | North Butte..... | 50¼ |
| Arcadian..... | 3¼ | Old Dominion..... | 52 |
| Atlantic..... | 8 | Osceola..... | 129 |
| Calumet & Arizona..... | 101 | Parrot..... | 30 |
| Calumet & Hecla..... | 625 | Santa Fe..... | 2¼ |
| Centennial..... | 80¼ | Shannon..... | 14¼ |
| Copper Range..... | 79¼ | Superior & Pittsburg..... | 15¼ |
| Daly-West..... | 7¼ | Tamarack..... | 62 |
| Franklin..... | 16 | Trinity..... | 11¼ |
| Granby..... | 100 | United Copper Con..... | 9¼ |
| Greene-Cananea, etc..... | 9½ | Utah Con..... | 47¼ |
| Isle Royale..... | 24 | Victoria..... | 4 |
| La Salle..... | 11 | Winona..... | 5 |
| Mass..... | 8 | Wolverine..... | 147 |

(By courtesy of J. C. Wilson, Mills Building.)

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|-------------|----------------------|------------|----------|-----------------|
| July 9..... | 12.87 | 4.33 | 5.40 | 51 |
| " 10..... | 12.82 | 4.33 | 5.38 | 51½ |
| " 11..... | Sunday. | No market. | | |
| " 12..... | 12.75 | 4.33 | 5.34 | 51½ |
| " 13..... | 12.75 | 4.31 | 5.34 | 51 |
| " 14..... | 12.75 | 4.31 | 5.34 | 50¾ |
| " 15..... | 12.75 | 4.31 | 5.38 | 51 |

MINING QUOTATIONS—NEW YORK.

Closing Prices.

July 8.

July 15.

| | July 8. | July 15. |
|--------------------------------------|---------|----------|
| Amalgamated Copper..... | 81 | 80½ |
| American Smelting & Refining Co..... | 96½ | 90 |
| Boston Copper..... | 14¼ | 14¼ |
| Butte Coalition..... | 24¼ | 23¼ |
| Cumberland-Ely..... | 7½ | 7½ |
| Dolores..... | 5 | 6¼ |
| El Rayo..... | 2 | 2 |
| Gliroux..... | 8¼ | 8½ |
| Greene-Cananea..... | 97½ | 9½ |
| Indiana Sonora..... | 3 | 3½ |
| La Rose..... | 8¼ | 8¼ |
| Miami Copper..... | 15¼ | 15½ |
| Nevada Consolidated..... | 22½ | 23¼ |
| Newhouse..... | 1½ | 1½ |
| Nipissing..... | 10½ | 11 |
| Ohio Copper..... | 47½ | 47½ |
| Tennessee Copper..... | 36½ | 37¼ |
| Utah Copper..... | 48 | 47 |
| Yukon..... | 4¾ | 5 |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 15.

| | \$ | | \$ |
|----------------------------|------|----------------------------|------|
| Atlanta..... | 10 | Mayflower..... | 9 |
| Belmont..... | 85 | Midway..... | 21 |
| Booth..... | 10 | Montana Tonopah..... | 65 |
| Columbia Mtn..... | 10 | Nevada Hills..... | 75 |
| Combination Fractious..... | 76 | Ophir (Comstock)..... | 1.30 |
| Daisy..... | 25 | Pittsburg Silver Peak..... | 47 |
| Fairview Eagle..... | 18 | Rawhide Coalition..... | 25 |
| Florence..... | 3.00 | Rawhide Queen..... | 40 |
| Goldfield Con..... | 6.30 | Round Mountain..... | 75 |
| Gold Keweenaw..... | 9 | Sandstorm..... | 10 |
| Great Bend..... | 7 | Silver Pick..... | 10 |
| Jim Butler..... | 10 | St. Ives..... | 10 |
| Jumbo Extension..... | 12 | Tonopah Extension..... | 46 |
| Llanos Con..... | 75 | Tonopah of Nevada..... | 6.62 |
| MacNamara..... | 25 | West End..... | 22 |

General Mining News.

ALASKA.

All the steamers of the first sailing from San Francisco and Seattle have arrived at Nome and have added about 2000 to the population of that city.—The Wild Goose Mining & Transportation Co. has begun operations in the Council City district for the summer.

ARIZONA.

COCHISE COUNTY.

The cross-cut from the 135-ft. level of the Monarch group cut 2 ft. of ore that assays between 3 and 4% copper. The ore is a sulphide in a limestone gangue. Two shipments have been made from the Morrow and Chamberlain claims of this group that averaged about 9% copper, 12 oz. silver, and \$3 gold per ton.—Surface work has uncovered a vein of lead-copper ore on the claims of Joe Larriau adjoining the Monarch group.—Development work on the recent find on the 1250-ft. level of the Denn is opening an excellent body of ore. The vein has widened to the width of the drift and picked samples have assayed from 30 to 40% copper.—The Bisbee Coalition Co., which recently took over the claims of the North Bisbee Extension Co., has acquired the Eureka group. On the former group the development is being carried on at the fourth level.—The Superior & Pittsburg Copper Co. is applying about \$50,000 per month to reduction of its indebtedness.

GILA COUNTY.

The Warrior Copper mine is shipping 60 to 70 tons of ore per day to the smelter. The winze is down 300 ft., but is soon to be sunk to the 1000-ft. level.—A station is being cut at the 900-ft. level of the Arizona-Colorado mine. On the fifth and eighth levels cross-cuts have opened some excellent orebodies. L. E. Phillips is in charge of the work.—The Inspiration Copper Co., in the Miami district, has taken over the Black Copper group of claims joining it. The claims have been prospected with diamond-drills and the cores have shown a good copper content. The Joe Bush shaft on the Inspiration ground is down 290 ft., mostly through a 2½% concentrating copper ore.—The roadbed of the Gila Valley railroad has been graded to Cordova and will be completed to Miami in a few weeks. The excavation for the foundations of the Miami mill is nearly completed.—A 4-ft. vein of ore has been opened by a cross-cut from the 300-ft. level of the Limestone shaft of the Superior & Boston Copper Co. The boilers for the new hoist at the McGaw shaft are in place and the hoist nearly ready for operation. The shaft is down 426 ft. A cross-cut is being driven from the 400-ft. level of the Gardner shaft to cut the Black Oxide vein.

GRAHAM COUNTY.

The raise from the 700 to the 500-ft. level in the Fumazole mine of the National Mining Exploration Co. near Safford is finished and over 150 ft. of cross-cuts have been run this month. F. A. Woodward is manager.

MOHAVE COUNTY.

The winze from the 250-ft. level of the Tom Reed mine is down 40 ft. in good ore.—A new hoist has been installed on the Ruth property and drifts are being run on the 70-ft. level. Assays of the ore run between \$27 and \$50 per ton.—At the Golconda mine the main shaft is being sunk at the rate of 4 ft. per day. The drift from the third level has been driven 200 ft. along a 4-ft. vein of ore that assays 50% zinc. One carload is being shipped to the smelter.

PIMA COUNTY.

L. J. and N. Corda have bonded their North Prosperity property in the Olive district to Eastern capitalists for \$35,000. L. J. Corda will have charge of the property.—The shaft on the old Chesterfield group is down 200 ft. and a cross-cut is being driven from that point to the vein. Surface work recently cut ore that assayed 5% copper, 13% lead, 22 oz. silver, and \$3 gold per ton at a depth of 26 ft. M. R. Chamberlain is superintendent.

PINAL COUNTY.

William P. Staffel has purchased a one-half interest in the Gold Bell group of claims near Kelvin from John B. Sebian.—The interests of the American Mines & Exploration Co. in the Gila and Ray Consolidated companies have been purchased by Bernard M. Baruch for \$1,000,000.

The adit of the Kelvin Tunnel Site Co. cut a vein of chalcopryite ore when in 600 ft., giving 400-ft. backs. Tom Hall is superintendent.

YAVAPAI COUNTY.

Lester Jackson, holding a two-year lease on the Gladiator mine, is opening that and the adjoining War Eagle group through the Gladiator shaft. A cross-cut from the 600-ft. station cut an iron-copper-zinc vein, and the War Eagle gold-silver vein, carrying a low percentage of the base metals. This has been driven on and two stopes put up 40 ft.—Enoch Williams received the second payment of \$2000 for the Baltimore group.—The Penn-Arizona Mining Co. is to install the largest electric hoist in Arizona at the Walker mine in the Mudhole district.

YUMA COUNTY.

(Special Correspondence).—The Lewisohns of New York, who recently took over the Planet group, announce that \$500,000 will be expended in development.—The Daly Mines Co. has let a contract for the sinking of a 135-ft. shaft on the Vulcan group.—The Shannon Copper Co. has secured control of the Blue Slate group and is arranging for extensive work. The claims contain several large deposits of copper ore with a good percentage of gold.—The Inland Copper Co. has installed a 50-hp. hoist at the main shaft.—Several rich finds have been recently made in this section, and a small rush is on from nearby points. The building of the Swansea-Arizona railroad is bringing many remote points in close touch with the commercial world. With shipping facilities assured, local mining men have commenced the active development of properties throughout the district.

Bouse, July 12.

A gasoline hoist is being installed at the Heart's Desire mine. The double-compartment shaft is down 100 ft. and cross-cuts started from that point. T. C. Varden is in charge of the work.—Cross-cuts are being driven from the 100 and 200-ft. levels of the Little Butte mine to cut an 18-ft. vein opened on the surface.

CALIFORNIA.

AMADOR COUNTY.

Lessees are shipping ore from the Onelda to the Selby smelter that assays from \$30 to \$80 per ton. The Onelda Mining Co. spent a large sum in equipment and development, but failed to open this rich shoot.—Development in the South Eureka mine is opening the recent find with satisfactory results.

CALAVERAS COUNTY.

The Ritter mine near Mountain Ranch has been sold to George E. De Golia for \$10,000.

DEL NORTE COUNTY.

The Doctor Rock copper mine has been sold to an Eastern syndicate by Mrs. F. C. Mariow. There is a large outcrop on the property that assays well in copper.—The Cleopatrina Mining Co. has applied for a patent to its ground.

ELDORADO COUNTY.

The shaft of the Mt. Pleasant mine at Grizzly Flats is unwatered to the 300-ft. level, and lateral work has been started at that point. The water is to be lowered to the 500-ft. point and drifts run on the vein.

INYO COUNTY.

The Buckeye Mining Co. is arranging to erect a 50-stamp mill. The ore is low-grade, averaging about \$4 per ton, but there is a large tonnage that can be worked in an open-cut.—The vein at the old Modock vein has been cross-cut and driven on from the lower adit, opening a body of lead-silver ore that assays 600 oz. of silver per ton. John Kelly is in charge of the work.—The Bishop Creek Milling Co. has installed a Sullivan 9-drill compressor and a Pelton

water-wheel. The shaft will be sunk to the 265-ft. level and a cross-cut driven to the shoot cut on the level above.

MONO COUNTY.

The Alden Mining Co. has run a 75-ft. adit and sunk a 90-ft. shaft on its property. Several cross-cuts from the bottom of the shaft have penetrated good ore.

NEVADA COUNTY.

The 20-stamp mill of the Giant King mine near Washington has been started. The mill at present is being operated by steam-power, but the company has purchased the Washington ditch and water-right and will install a hydro-electric plant. A lower adit is being driven to cut the vein.

PLACER COUNTY.

The shaft at the Orpheum mine is down 162 ft. A 5-stamp mill has been purchased from the Risdon Iron Works and is being hauled to the mine. Charles Peach is superintendent.—The Herman Property Syndicate has paid off the \$11,000 indebtedness of the Herman mine and is re-timbering the air-shaft. E. B. Quigly is in charge of the work.—The Boulder Ridge Syndicate is operating the Patterson mine north of Penryn.—Harold Power is working the Hidden Treasure and Mountain Gate gravel mines through the Hidden Treasure slope.—Some excellent gravel is being taken out of the Bonanza mine at Gold Run. J. D. Stewart is superintendent.—The old Paragon channel has been cut by the adit at the Paragon mine. W. S. Fletcher is in charge of the work.

SAN BERNARDINO COUNTY.

The shaft on the Oro Belle is down 260 ft. and a drift run 325 ft. on the vein. On the 200-ft. level the cross-cut has intersected the vein and assays show the ore to be of milling grade.—The Todhunter lease is shipping ore. A winze is being sunk in milling ore.—A drift has been started at the 700-ft. point of the Big Chief adit along a streak of ore that assays about \$100 per ton. William L. Foster is manager.—The Eldorado-Searchlight Mining Co. is to install a mill and cyanide plant at the Old Bonanza mine. George Freeborn is president.—The Kramer Consolidated Oil Co. struck a flow of oil in its bore-hole near Kramer at a depth of 2930 ft. A large amount of gas is present and the oil is of a light quality. Two other companies are drilling in the same district.

SHASTA COUNTY.

A new adit on the Wild Bear claim of the Friday-Lowdon group above Kennett has cut a streak of good copper ore.

The Mountain Copper Co. has let contracts for the installation of new machinery at Keswick and Iron Mountain. Plans are ready for the construction of a new smelter across the creek from the old plant.—The Peterson group of claims near Heroult has been bonded to the Stauffer Chemical Co.—The Western Exploration Co. has given up the bond on the Spread Eagle group near Kennett and has bonded the Stowell group.

SIERRA COUNTY.

S. B. Graciar and H. P. Haley are to start work on their Hunch property near Alleghany some time this month.—C. L. Wilson has bonded the Metropolitan mine from William Reynolds. The mine has been opened by several adits and some good ore taken out.—A cross-cut from the 680-ft. level of the Alaska mine at Pike City intersected the vein and drifts are being run in both directions in good ore. George St. John is superintendent.—The water-right, flume, and Bonanza quartz claim of W. A. Lotspeich and Con Yorke have been attached for labor bills amounting to \$2500. There is also a lien of \$700 filed against the property.—The adit at the Antlers quartz mine has been cleaned out and work started on the vein. Tom Winrod is in charge of the operations.—The power-house of the Four Hills Mining Co. is being repaired and the adit re-timbered preparatory to starting the mine.—George F. Stone and associates, holding a bond on the Uncle Sam group, have started a shaft to cut the vein.—The adit on the San Fernando group has been cleaned out and re-timbered for 300 ft. A drift will be started shortly to cut the ore-shoot found in the level above.—The shaft at the

Gibraltar mine of the Kleffer brothers is being unwatered and will be sunk to the bedrock.

TRINITY COUNTY.

H. E. Crowell brought the 'clean-up' from the Union Hill mine to Weaverville. The company has an excellent bank of gravel and a good water supply.—The Enterprise is stoping ore that carries a high percentage of sylvanite and telluride ore. George S. Fenwick is superintendent.—The final clean-up for the season has been made at the Testy mine.—The Folsom Development Co. is drilling the Sykes and Ellery properties at Trinity Center to determine their value for dredging.

TULARE COUNTY.

A Los Angeles company has secured an option on some property in the foot-hills near Lindsay which shows some oil seepages and will commence drilling shortly. The land is in the heart of the Lindsay orange belt.

TUOLUMNE COUNTY.

F. E. Willetts has secured a lease and bond on the Anderson mine from E. N. Anderson. There are two shafts on the property that have cut a vein which assays \$50 per ton.—An 80-ft. adit at the Thompson mine near Tuttletown is opening some good ore.—A Huntington mill has been installed at the Santissimo.

COLORADO.

BOULDER COUNTY.

A 6-ft. vein has been opened by the lessees of the Highland Mary mine on Breece hill.—An electric hoist and new head-frame have been installed on the Vinnie property of the Golden Eagle Mining Company.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work is to be resumed in a few days upon the McClelland adit, now in a little over 7000 ft.—A fine body of galena ore has been uncovered in the upper adit of the Josephine mine, on Kelso mountain. The vein is from 14 to 18 in. wide, and assays from \$70 to \$80 per ton in silver and lead. J. R. Sapp is manager. For the last month shipments have been from 60 to 80 tons per week.—C. Runkle, holding a bond and lease on the Colorado Central-Allunde group of mines on Leavenworth mountain, will commence shipping within ten days. A streak of silver-lead ore from 2 to 8 in. wide, on the sixth level, assays from 275 to 550 oz. in silver per ton.—W. Farragher, leasing the Astor on Democrat mountain, has struck a vein of 175-oz. silver ore that is from 8 to 12 in. wide.—U. Whittier has resumed work upon the Dolly Varden group of claims on Griffith mountain.—The Jewell mine at Silver Plume has been purchased by S. H. Bradley from the Jewell Mining, Milling & Leasing Co.—S. Farout is developing the Lafayette property. The drift is following a streak of \$25 gold and silver ore that is from 4 to 6 in. wide.—B. J. O'Connell has started shipping from the Gambetta mine. The lead-zinc ore is being sent to the Linn concentrator for separation.—The Capital Mining & Tunnel Co., on Griffith mountain, is putting from 120 to 130 tons of ore per day through its concentrator. In addition to this a heavy tonnage of smelting ore is being sold at the local sampler. W. M. Cooper is manager.

Georgetown, July 11.

GILPIN COUNTY.

A test lot of ore was shipped from the Mackey mine in Elk Park to the sampling works at Denver to determine the best form of mill to be erected on the property.—Operations are to be resumed at the property of the Golden Rod Mining & Milling Co. on Silver creek. G. Battaja will be in charge of the work.—The Pendleton-Gomer Mines Co. has taken over the Gomer quartz mine and several placer claims in the Russell Gulch district. The shaft will be sunk 500 ft. from the 160-ft. level and cross-cuts run to the vein, which has assayed well in the upper level. A. A. Johnson is manager.

GUNNISON COUNTY.

The Crested Butte Coal Co. has opened a 6-ft. vein of coal 65 ft. below its former workings. The coal is of a good quality and the company will transfer its active opera-

tions to this vein.—The Waunita Coal Co. is opening some excellent coal properties below Somerset. Alex. Bowers is superintendent.

SAN JUAN COUNTY.

Hennings & Bastian have sub-leased the Tiptop property west of Eureka to Matt Sutherland and associates.—The adit on the Allerton property in Prospect gulch is in 400 ft.—The Esmeralda shaft has been unwatered to the second level and some good ore exposed.

SAN MIGUEL COUNTY.

Farrell & King have leased the Summit mine and the Gold King mill near Ophir. The tramway from the mine to the mill has been repaired and some excellent ore taken out.

SUMMIT COUNTY.

A new crusher has been installed at the Blue Flag mill on Baldy mountain. The last clean-up of the French Gulch Gold Mining Co.'s dredge amounted to \$18,500.—The International mine near Robinson is being re-opened. The mine closed down about two years ago, after shipping a small amount of ore from the 1100-ft. level.

TELLER COUNTY.

Seaver & Henry are shipping regularly from their lease in the Mattie L. mine.—A gold retort estimated to be worth \$5600 was sent to the U. S. Mint at Denver by Edward Gaylord, operating the Gaylord cyanide mill on Ironclad hill, and lessees of the Jerry Johnson and Arapahoe mines. The retort represented the clean-up on 1600 tons of ore.—Eighteen cars of ore were shipped during June from the W. P. H. mine on Ironclad hill by Oscar Gobleman, general manager for the Roach & Fogleman lease on the United Gold Mines Co.'s property.—The Forest Queen mine shipped two cars of ore that averaged \$35 per ton.—The Union Leasing Co. has secured a two-year lease on the Bonanza Chief on Beacon hill, and a shaft is being sunk from the surface near to the Hiawatha line.—Two cars of ore were shipped from the Morning Star mine on Bull hill.—The recent strike on the 1300-ft. level of the Vindicator is proving a bonanza, as an 8-ft. vein has been opened that assays \$100 per ton. A dividend of $1\frac{1}{2}$ ¢. per share has been declared.—The Doctor Jack Pot Mining Co. declared a dividend of $\frac{1}{2}$ ¢. per share, amounting to \$15,000.—A dividend of 2¢. per share was declared for July 15 by the Portland Gold Mining Co. The total amounted to \$30,000.—Word & Hill received a settlement of \$45 per ton for a shipment of ore from their lease on the Pharmacist mine.

IDAHO.

BLAINE COUNTY.

The Muldoon mill at Muldoon has been started and is turning out 50 tons of concentrate per day. There are 14 stopes opened in the mine, but at present one in the upper level is supplying the mill. Robert T. Tustin is in charge of operations.—The Independence and Cannonball mills are to be started shortly.

IDAHO COUNTY.

The drift on the lower level of the Buster mine has been run 100 ft. on the vein and is expected to cut the ore-shoot at any time. The company has taken up a water-right and power-site on Red river. J. F. Thorn is superintendent.—A raise from the 350-ft. level of the Penn-Dixie cut an ore-shoot that assays well. W. L. Sendker is superintendent.—A 14-in. vein has been cross-cut in the Black Diamond mine.—Brown & Hartman cut a 4-ft. vein on their Saylor group.—The Champion mine on Thunder mountain cut a 2-ft. vein on the 300-ft. level that assays as high as \$800 per ton. A. R. Balcom is in charge of the work.

KOOTENAI COUNTY.

A 400-ft. adit on the Black Jack group near Lane cut a vein from which samples were taken that assayed 15% nickel, 20% copper, 15% lead, and 25 oz. silver per ton. Thomas Gonyea owns the claims.

NEZ PERCE COUNTY.

Charles Hofstetter, of Spokane, and associates have secured a lease on 200 acres of State land near Kaniyah, containing asbestos deposits.

OWYHEE COUNTY.

A cross-cut in the Gold Crown mine cut a streak of ore that assayed between \$900 and \$1500 per ton. The mill is running successfully, having recently shipped \$14,000 worth of amalgam. L. Foester is manager.

SHOSHONE COUNTY.

The shaft being sunk from the 4500-ft. point of the Gold Hunter adit is down 100 ft. A cage has been installed and the shaft will be sunk to the 600-ft. level. Dennis Ryan is manager.—The adit of the Lucky Swede mine in the St. Joe district is being re-timbered and the company will have an orebody of shipping grade opened shortly.—The management of the Hercules mine is negotiating for the purchase or lease of the mill at the Tiger mine at Burke.—A deep adit is being driven on the property of the Alpena Copper Mining Co. near Wallace. There is a large amount of shipping ore blocked out in the mine and piled on the dump.—The Moonlight Mining Co., operating in Gorge gulch, near Burke, levied an assessment of 2¢. per share. It is proposed to drive an adit 3000 ft. to tap the vein at depth in the sulphide zone. J. N. Murphy is manager.—The Bunker Hill & Sullivan Mining & Concentrating Co. has paid dividend No. 142 of \$45,000.—A rich strike of nearly pure galena carrying 200 oz. of silver per ton was made in the Caledonia mine, and regular shipments are being sent to the smelter.—The Butte & Coeur d'Alene Mining Co. is sinking a shaft on its property east of Mullan and will cross-cut to the vein. A winze is being sunk in the ore.—A new Hancock jig with a capacity of 500 tons per day has been installed in the Morning mill.—The pay-streak of the Holy Terror mine has widened to about 3 ft. An adit is being run on the vein, to intersect the shaft, that will give 1200 ft. of backs. The ore assays 37% lead, 22 oz. silver, and \$8 gold per ton. Ole Holk is president of the company.—The Black Bear Fraction Mining Co. has opened a good body of milling ore and is to concentrate it in the Frisco mill. Peter Bernier is superintendent.—The Northern Light Mining Co. is opening an orebody that assays 11% copper and 2% lead. A prospect shaft on the property has opened a 14-in. vein of galena ore.—The Carney Copper Co. is driving an adit to open the vein at a depth of 500 ft. An upper cross-cut opened an 8-ft. orebody that averaged more than 3% copper.—Shaft sinking has been resumed at the 200-ft. level of the Bullion mine.—A 1040-ft. adit on the Manchester property cut a 6-ft. vein of fair milling grade. Joseph Blackburn is in charge of the work.

KANSAS.

CHEROKEE COUNTY.

The Hartford mine has resumed operations south of Galena since the zinc-blende has gone above the \$40 mark.—Waterhouse & Co. has purchased a 300-ton mill from the Webb City camp and will remove it at once to the Maggie Taylor lease at Galena.—The Lizzie D. mill on the Dwyer lease at Peacock is completed and will be started about the middle of this month. The ore here is of a sheet-ground formation, running 5%, and found at 180 ft. About 150 ft. of drifts have been run. The ore carries a 10-ft. face.

MISSOURI.

JASPER COUNTY.

The Optimo, O. K., and Lone Pilgrim, in the Sarcocite camp, have been consolidated under the management of W. L. Bramblet.—The John Nilson farm at Carl Junction has been purchased by the Lehigh Mining Co.—In Jackson Hollow the M. I. & O. mill has been overhauled and is again producing.—The Newsboy, in the Duenweg camp, is again working after an idleness of several years.—Work has been resumed at the Nortonia in the Chitwood camp.—Among the more recent mills ready for operation is the plant of Starkweather, Schweiart & McGill at Neck City.—Gray & Stevens are preparing to erect a mill for the treatment of the dump-ple on the Shifferdecker land west of Joplin.—Douglas & Co. is preparing to erect a 500-ton plant on the Luke & Ash ground west of Joplin. A double-compartment shaft is down 197 ft. in a sheet-ore formation.—The Carnation at Prosperity began opera-

tion of its new 300-ton mill on a lease of the Cosgrove ground. The shaft is down 285 ft. in a disseminated ore formation below the sheet-ground.—A rich strike was made at Carl Junction across the creek from the Mohler Smith.—New York miners are to begin the prospecting of a 160-acre tract at Bell Center west of Joplin, and have let the contract for 2000 ft. of drilling.

NEWTON COUNTY.

Southwest of Wentworth, on the Conway property operated by Joplin and Wentworth men, drifts have been cut at 30 ft. which show good mineral.—A shaft is down 70 ft. on the Poland, both galena and silicate being found.—In the Spring City camp the Plata company is taking up a rich stope.—Preparations are being made to develop a large tract between Spring City and Baxter Springs by the Granby Mining & Smelting Co.—A good strike of silicate was made in the Granby camp by Paynter & Stanley on the Reed ground.—A strike has been made in the Colored Lady lease and a new shaft will be sunk at once.

MONTANA.

MISSOULA COUNTY.

Supplies have been taken to the Monitor mine, five miles from Saltese, and the shaft is being unwatered. A copper vein has been proved to the 700-ft. level. H. F. Samuels and Ole Linn are managers.

NEVADA.

CLARK COUNTY.

The shaft of the Lucy Gray mine is down 300 ft. and a station is being cut at that point. An 8-in. vein was cut at 75 ft. that assayed \$165 per ton. A cross-cut will be driven to this and drifts run along it.—The Eldorado Crown Mining Co. has been incorporated to work the Crown, Queen, and Cross claims. Assays from the veins on these properties run between \$8 and \$14 per ton. It is proposed to build a mill and cyanide plant. George Bergman, John McGreer, and Henry Dickson are the principal stockholders.

DOUGLAS COUNTY.

The Spreckles Sugar Lime Rock Co. of San Francisco has bonded the Winters mine, 18 miles north of Gardnerville, for \$100,000. The property contains 200 acres in the Pine Nut range.

ESMERALDA COUNTY.

The cross-cut from the 450-ft. station of the Victor shaft of the C. O. D. mine cut a body of ore that resembles the rich ore of the district.—The Codd Mines Co. has secured an extension of its lease on the St. Ives property at Rawhide. A good body of ore has been opened on the 200-ft. level and the shaft will be sunk to the 1000-ft. point.

HUMBOLDT COUNTY.

The Monette Mining & Milling Co., in the Seven Troughs district, in the west cross-cut from the 400-ft. level of the shaft cut a stringer of high-grade ore.—The Kindergarten mill is running on ore from the Wihuja lease that runs about \$200 per ton. A cross-cut on the lower level of the Kindergarten is being driven to get under the richest point in the level above.

NYE COUNTY.

(Special Correspondence).—It is planned to commence the shipment of ore from the West Extension to the smelter at Needles. Ore valued at \$300,000 is blocked out in the main workings of the mine, and 125,000 tons of \$23 ore is piled on the dump.—The Rickard-Garberg lease at Pioneer has struck a large vein of milling ore on the 300-ft. level.—The Cliffords and Nays have commenced work on the driving of an adit at Elendale to tap the vein disclosed in the original locations at a depth of 100 ft.—The greater portion of the Jim Butler estate has been leased for a period of two years to H. C. Epstein and C. S. McCarthy. The lease comprises a portion of the Curtis, Eureka, and Sunset claims, and work will be commenced in the Fraction No. 1 shaft.—Placer mining activities at Manhattan continues to hold the attention of southern Nevada operators. At the Giffen lease on the Verde claim 100 yd. of gravel is handled every 24 hours.—On the Dividovitch lease a 15-hp. Witte gasoline hoist and 6-in. Cornish pump have been installed.—The Big Five is producing at the

rate of \$100 per day.—The Allison-Philbrick lease on Wednesday Fraction is installing a washing plant and expects to commence operations within a few days.

Rhyolite, July 11.

The Mayflower Consolidated Mining Co., in the Bullfrog district, has contracted with the Nevada-California Power Co. for electric power sufficient to operate the mine and mill. Underground work is being centered on the new shoot being opened on the 300-ft. level. The Alward lease on the property is down 65 ft.—The Skidoo Mining Co. has purchased the Epstein & McDonald lease and is now running the 15 stamps on company ore.—The bi-monthly clean-up at the Montgomery-Shoshone approximated \$25,000. A Chilean mill is being installed and will be running in a few days.—The Morgan, Stofelt & Cook lease on the Blue Jacket property at Round Mountain has a pile of \$100 ore on the dump ready for a mill-run.—The Tonopah Extension Mining Co. is to issue 5-year bonds to raise \$150,000 necessary for the construction of a mill on the property.—Sinking has been resumed in the Belmont shaft of the Tonopah-Belmont.—The foundation for a 12-drill compressor has been completed at the Tonopah Mining Co.'s property.—The Jolly Jane lease at Pioneer has installed a 20-hp. electric hoist.

WHITE PINE COUNTY.

The Brilliant shaft of the Ely Consolidated Copper Co. had to be abandoned recently owing to the heavy flow of water. S. F. Snyder is superintendent.—The drill-hole on the Clipper claim of the Ely Central has caved for over 100 ft. and will have to be abandoned. A shaft is to be started on this claim sometime soon.

NEW MEXICO.

GRANT COUNTY.

The Chemung Copper Co. has levied an assessment of \$1 per share. The mine is opened to the 800-ft. level, showing orebodies that assay from 3 to 4% copper. A survey for a railroad to the mine is being completed.

SOCORRO COUNTY.

A 225-hp. electric hoist has been installed at the Socorro Mines Co.'s Little Fannie mine at Mogollon. At the new mill 30 stamps are in place and 10 can be added when the mine output warrants it. The mill will be started in the early part of August. James A. Force is manager.

TAOS COUNTY.

The Lillian Mining Co., operating a lease on the Lillian mine, seven miles north of Red river, is developing a vein that mills between \$15 and \$20 per ton. There is a 10-stamp mill on the property that will soon be started.

OREGON.

BAKER COUNTY.

The Double Eagle group near Greenhorn has been bonded and is to be opened shortly.—W. A. Gillian and associates have commenced work on their Three Links property. Two veins, 18 in. and 3 ft. wide, have been opened by surface cuts and a short adit. The company will sink and cross-cut the vein at a depth of 100 feet.

GRANT COUNTY.

The Anniversary Gold Mining Co. has been incorporated to open the Anniversary group in the Granite mining district. A drift has been driven 575 ft. on the vein and a 275-ft. raise put through to the surface. The vein for this distance averaged 18 in. wide and assayed from \$8 to \$20 per ton. Frank Pence is in charge of the work.—C. E. Curry is having lumber hauled to the Trail creek placers for flumes and sluice-boxes.

UTAH.

JUAB COUNTY.

In the main adit of the Blain group in the west end of the Tintic district a vein has been cut that assays about 50% lead and 8 oz. silver per ton, with some gold. A lower adit is being driven to drain the property, as a winze on the vein struck a heavy flow of water. B. F. Fleimer is in charge of the work.—At the Eureka Lily the shaft is to be sunk to the 500-ft. level. On the 200 and 300-ft. levels

some excellent ore has been opened.—A double-compartment shaft is being sunk on the Selma group in North Tintic.—An electric hoist is to be installed at the Tintic Empire, at Tintic, to sink to the 200-ft. level. Al. Moore is in charge of the work.—Two cross-cuts are being run on the McKinley property in search of the orebody.—The Grand Central has opened its orebody on the 2000-ft. level west of the shaft. A cross-cut for this shoot has also been started from the 1800-ft. level.—A 25-ton shipment from the Beatrice mine averaged \$21 per ton. P. J. Daly is in charge of the work.—The July shipments of the East Tintic Development Co. will amount to four carloads. The ore brings a premium at the smelters on account of its high percentage of lead.—On July 10 the Sioux Consolidated declared a dividend of 7c. per share, and the Colorado and Iron Blossom companies declared dividends of 8c. per share each.

SALT LAKE COUNTY.

A double-compartment shaft is being sunk on the property of the North Bingham Mining Co. in Barney's canyon. A recent shipment to the smelter assayed \$32 gold per ton.—The Bingham Mines Co. has closed a contract with the Yampo Smelting Co. to deliver from 100 to 150 tons of copper-iron ore to the smelter from the Commercial mine. The company is shipping lead-silver ore from the Dalton and Lark mines to the smelter of the American Smelting & Refining Co. Imer Pett is manager.—The thirteenth unit in the mill of the Boston Consolidated has been started and the company is handling between 2700 and 3000 tons of ore per day. A. J. Bettles is mill manager.—The Utah Consolidated Mining Co. has let a contract for the construction of an aerial tram from the mine in Carr Fork canyon over the West mountain range into Pine canyon to the Trenton Iron Works.

TOOELE COUNTY.

The report of the Cliff Mining Co. shows a profit for the past fiscal year of \$50,000. The mine shipped only a portion of the time, owing to the low price of silver and lead, but spent a large portion of the time in development work. In the upper and main adits and on the lower level 120 ft. below the main adit the shoot has been opened more than 400 ft. Grant Snyder is manager.

WASHINGTON.

FERRY COUNTY.

The Republic mine in the Republic district shipped its fourth 50-ton car of sacked ore to the smelter. This ore runs above \$150 per ton.

OKANOGAN COUNTY.

Charles H. Brooks, of New York, has bought the Gehard group of claims on Palmer mountain.

STEVENS COUNTY.

Howland Bancroft, of the U. S. Geological Survey, is in the Chewelah mineral district to make a detailed survey of the district for the Government.—The Evergreen Mining & Development Co., near Colville, will commence shipping in August. William P. White is secretary.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The McKinley group of copper claims in Franklin camp, 40 miles north of Grand Forks, in the Phoenix district, has been bonded by G. A. McLeod and associates, of Spokane. The ore is copper and gold and assays between \$12 and \$40 per ton.—A compressor and drill has been added to the equipment of the Greenwood-Phoenix property. The adit is now in 160 ft.—H. R. Robbins, of Seattle, has been appointed mining director of the Apex group in the Similkameen district and has moved his residence to the mine.—The Blue Bird Mining Co., through Lyman Carter, has purchased the lease of Whitford & Jenkins and will sink a double-compartment shaft on the Blue Bird mine. Carbonate ore has been opened which assayed as high as \$80 per ton. About 40 tons of this ore has been shipped to date this year, and there is a carload now at the mine ready for shipment.

Placer gold has just been found on Seymour creek near Vancouver. It is claimed by the prospectors who have located ground on the creek that gravel will assay from

\$150 to \$200 per ton. Panning the sand the prospectors obtain 10c. to 20c. per pan, and it is asserted that gold at 4c. per pan will pay.—Another rich strike is reported from Portland Canal on the property of the Stewart Mining & Development Co. The ore assays \$24 to \$34 in a vein averaging 6 ft. and traceable for over 2000 feet.

Vancouver, July 10.

A new diamond-drill has been started to prospect the ground in the Ymir mine in East Kootenay.—The Highland mine near Ainsworth has been purchased by J. S. Airheart from W. J. Wilson.—A tramway is being built at the Aurora mine, near Moyie, to carry the ore from the tunnel down to the lake for shipment.—A trial lot from the Gold Note mine, a short distance west of the Granite Poorman, has been shipped to the Trail smelter.—A payment of \$15,500 was made on the Kootenay Belle, Sheep Creek, by the purchasers, J. L. Warner, F. M. Black, and F. E. Morrison. This is the third payment to the owners, Thomas Bennett and H. M. Billings, of Nelson.

ONTARIO.

A 75-ft. drift on the 100-ft. level of the Temskaming & Hudson Bay mine has opened a 3-in. shoot carrying 2500 oz. of silver. The company is now running 700 tons of second-grade ore that has been stored on the dump through the concentrator with satisfactory results.—Surface work on the Lawson mine has opened a cross-vein from the Silver Sidewalk that assays high in silver. It has been stripped for 200 ft.—The report for the Buffalo Mines, Ltd., for the past fiscal year shows 931,991 oz. silver and 54,794 lb. of cobalt mined that netted a profit of \$204,289. The cyanide plant is nearly completed and the mill is to be enlarged to handle 200 tons of ore per day. Thomas R. Jones is superintendent.—A 20-stamp mill is to be erected at the Nova Scotia mine. D. M. Steindler is president of the company.—A 6-in. vein carrying smaltite and native silver has been cut at the 75-ft. level of the Otisse mine at Silver lake.

MEXICO.

CHIHUAHUA.

The celebrated Mexican silver mines, near Parral, formerly owned by Pedro Alvarado, who once offered to pay off the Mexican national debt with profits taken from his mines, have been purchased by an American syndicate. A corporation called the Alvarado Consolidated Mines Co. has been formed to operate the mines. Shares of the company are now being offered for sale in New York and Boston. The par value of the shares is \$10. They are offered at \$5. Elaborate prospectuses have been circulated. They state that the company desires to sell 200,000 shares to raise money for a cyanide plant.

COAHUILA.

The Coahuila Mining & Smelting Co. has opened a body of ore on the Alberto property about 300 ft. from the present working that assays about 2 kg. silver per ton. W. A. Williams is manager.

JALISCO.

Patrick Clark, of Spokane, has sold his interest in the Magistral-Ameca mines, near Guadalajara, to his partners, who will continue the development of the copper property.

SONORA.

The Candelero Mining Co. is building a mill and cyanide plant on their property near La Barranca. S. Ben. Smith is superintendent.

ZACATECAS.

A new cyanide plant is being erected in the city of Zacatecas for the custom treatment of the low-grade ores of that district. Marcelino Velasco y Peña, the engineer who has made the estimates and plans for the plant, calculates that the extraction and treatment costs will approximate \$5 per ton. A 50-ton unit will be first put in operation, and others added as the needs of the plant increase. The State Government has taken an active interest in the project and aided it with a subscription of \$30,000 for 1200 shares of the company's stock.

TASMANIA.

The Oona Mines, Ltd., has started smelting at its mines near Zeehan. The work is proceeding smoothly.

Special Correspondence.

LONDON.

Mining Tax.—Burma Ruby.—Mond Nickel.—Aluminum.—Institution of Mining Electrical Engineers.—Exploration Company.

In a recent letter I referred to the proposition for the taxation of unmined minerals. The purpose is to make the landowner pay one half-penny per pound per annum on the value given to the land for its mineral contents. This measure was aimed at the coal and iron lords, and the difficult matter of assessing is to be left in the hands of officials of the tax office with no provision for appeal to the courts. The opposition is naturally strenuous. The taxation of mineral values before they are won is a doubtful economic policy. Furthermore, the act does not define the word 'mineral'. The Government declines to provide this definition, saying that the intention is to use the word in its legal sense. When it is pointed out that the judges have given a variety of different definitions of the word, the spokesman says that the matter of interpretation will be left to the tax officials. In this column about a year ago I gave an account of the dispute between a railway and a china clay company as to the meaning of the word 'mineral'. It was then argued that china clay was not a mineral, because it was a mixture, being the result of the decomposition of a rock. This was the narrow mineralogical meaning of the word, but as the action was being taken under an act which specifically included granite, slate, and coal in its definition of mineral, it was obvious that china clay also must be included. In all legal decisions a mineral has been held to be some substance of the earth's body which imparts to the land a value apart from its surface value, and the only difference in the various decisions relates to such substances as brick earths, brick clays, gravel, and sand. There is also some doubt as to where the line must be drawn in connection with chalk. If the decision, as to what is or is not a mineral under the taxation act, be placed solely in the hands of the tax officials, everything will be classed as mineral, because it is to the interest of the officials to catch everything. However, the act has not yet passed into law; perhaps it never will.

The market for precious stones continues to be in a depressed condition, as may be gathered from the position of the Burma Ruby Mines, Ltd. These mines belong to an English company which was floated by the Rothschilds 20 years ago. The history of the company has been somewhat melancholy, because of losses of capital, floods, bad times, and high royalties. The year which ended February 29 last was a disastrous one financially, £8242 having been lost. The mines have been shut down partly and only day work has been attempted. The total amount of ruby earth washed during the year was 1,071,166 trucks, compared with 2,033,666 trucks in the previous year, and the average cost per truck increased from 7s. 6d. to 7s. 9d. The depression in the market for colored stones seriously affects their sale in London, though the local demand in India continues fair. The only policy for the company to adopt is to husband their resources, and in the meantime to obtain a remission of arrears of rent and current rent due to the Government. The construction of the drainage tunnel which was commenced three years ago was completed last summer, and has proved highly efficacious in clearing away the water from the lower levels after the floods which are common in that district.

The Mond Nickel Co., Ltd., became an established commercial success a year or two ago, and the dividends paid are now steady and permanent. During the year which ended April 30 last the profits were £141,242, as compared with £137,098 during the year previous. The rate of dividend is the same as in the previous year, being 7% on preference and 15% on the ordinary shares. Each year £22,800 went to the holders of the deferred shares. The amount placed to reserve was £20,000, as compared with £25,000 the year before. During the year £250,000 of additional capital

was raised by the issue of 50,000 new preference shares of £5 each, for the purpose of completing the hydro-electric power station on the Vermilion river and electrifying the mining and smelting plant at the Victoria mines. Both of these works are now completed, and will effect considerable economies.

The position of the English companies producing aluminum continues to be a very precarious one. It is only a few months ago that I recorded the re-organization of the Aluminum Corporation which was formed as recently as two years ago. This failure was not altogether unexpected, as the company had no supplies of raw material. The other company, the British Aluminum Co., when I wrote my last notes on the subject of the production of aluminum in this country, seemed to have passed through its troubles and arrived at a period when shareholders might expect to receive some return. It is decidedly disconcerting, therefore, to find that in the Chancery Court this week application was made for a receiver and manager on behalf of the debenture holders. It appears that the company has bills maturing on July 1, amounting to £100,000, and there is also a substantial overdraft. The company was originally formed in 1894 and started hydro-electric works in Scotland, at the celebrated Fall of Foyers. It also acquired supplies of bauxite in the north of Ireland. For many years financial mismanagement and technical difficulties involved the company in all sorts of difficulties. It became necessary on several occasions to raise new capital and to re-organize. Recently large sums of money were raised for the construction of new works at Loch Leven, near Ben Nevis, in Argyllshire, since the capacity of the Foyers plant was too small. The new plant is now practically completed and is an excellent specimen of modern electro-metallurgical engineering. The great drop in price of metal appears to be the immediate cause of the present financial difficulty. Last year I referred to this and pointed out that when the price had been reduced to that of copper, the future use of aluminum should be greatly extended. This is borne out by the experience of the British Aluminum Co., but unfortunately the drop in the price has hit them more than the increased demand has done good. Until the Loch Leven works are in full swing it is impossible for them to even matters. The receivership will strengthen the company's position and enable it to weather the storm. It may be of interest to note that the debenture holders who petitioned the court for the appointment of a receiver were the executors of the late Charles Morrison, the millionaire, who was the nearest approach to your late Russell Sage that has been produced in this country.

Of the formation of new technical societies there is no end. The latest formed in England is the Institution of Mining Electrical Engineers, and its object is to get together the engineers who are in charge of electrical plants at mines. The membership is being confined for the present to engineers in the United Kingdom, but it is hoped eventually to cover the whole world. There are to be branch sections in each mining district, and local as well as central meetings will be held. The qualifications are that the applicant must have been in charge of an electrical installation of a certain magnitude in a mine for so many years, or be a member of the Institution of Electrical Engineers. The Institution originated from the efforts of J. Williams, of Whitehaven, Cumberland, and William Maurice, of the Hucknall Colliery, Nottingham. As I have often remarked in these columns, the application of electricity in mines requires close study, for there have been many bad failures in connection with it in England, and the formation of a society which will bring together those who are responsible for the success of such plant should serve a useful purpose.

It has always been the policy of the Mexican mines controlled by the Exploration company to publish what may be called a forecast of the regular yearly report. Such information has just been given out by the El Oro Mining & Railway Co., Ltd., and the Mexico Mines of El Oro, Ltd., with regard to the results for the year to end June 30. For the Mexico Mines of El Oro, the estimated profit is £152,143, out of which £112,500 is being distributed as dividend and £25,000 devoted to writing off expenditure on the

mill. The El Oro company's profits for the same period are estimated at £207,000, of which £172,125 is to be distributed as dividend, and £33,270 written off all expenditure on improvements incurred during the year.

MEXICO.

Zacatecas Custom Plant.—Cerro de Proano at Fresnillo.—Railroad Connections.—Oil Development.—La Blanca, Pachuca.

In a recent letter I spoke of the new cyanide plant in contemplation of Zacatecas by Marcelina Velasco y Peña, and stated that though of sufficient size to make commercial runs, it would be solely a testing plant. It now appears that the plans of Sr. Velasco y Peña and his associates are to construct a 50-ton mill and run it as both a testing and a custom plant, making experimental runs on ores or buying ores outright, as their clients may desire. It is believed that 350-gm. silver ore may be handled without loss, and that 600-gm. ore may yield a nice profit. It is to be capitalized at \$150,000, with 6000 shares of \$25 each, and the hope is that it may be pushed to rapid completion, for it is certain to have a stimulating effect on mining about Zacatecas. At Fresnillo, in the State of Zacatecas, and but a short distance above the city of that name, on the Mexican Central railroad, Robert S. Towne has taken an option on the old workings of the Cerro de Proano, which have yielded silver as far back as 1558. In the time of the option—one year—he will make a thorough test and examination of the ores and workings, as to extent, tonnage, and economical treatment. As Mr. Towne has for many years been leaching the old Fresnillo tailing-dumps from these same workings, first by hyposulphite and more recently by cyanide, he is thoroughly familiar with the work and ore at hand, and is excellently equipped for carrying out his experiments.

One of the most important reports that has reached Mexico recently, in addition to the contemplated new work in railroad building by the Cananea Consolidated Copper Co., and of the Mexican Northwestern railway, is that the Kansas City, Mexico & Orient railway has entered into some kind of a traffic arrangement with the Chicago & Alton, whereby, with the latter and its Eastern connections by the Chesapeake & Ohio to Old Point Comfort, the K. C., M. & O. may, when completed to Topolobampo bay, have a through traffic arrangement from the Atlantic to the Pacific that will be some 800 miles shorter than any other, and will mean much for the west coast of Mexico. If there is anything in this report, it is expected that the Chicago & Alton may in some indirect way assist the K. C., M. & O. (or Orient, as it is called) financially in the completion of its line. Of great importance to the southern part of Mexico is the concession recently granted for a 150-km. railroad from Tezuitlán to the new gulf port of Nautla, running through the States of Puebla and Vera Cruz, with branch lines to the oilfields of Fubero and Dos Bocas. It is stated that there is about \$5,000,000 behind the project, and an excellent future is predicted for it, as connection may be made at Tezuitlán with the Inter-oceanic, and thereby a shorter line, between Mexico City and the Mexican gulf than any existing, be created. As the Tampico and Vera Cruz wharfage facilities are overwhelmed, it is believed there is room for a great deal of business for the new port, and for the new road. At the oilfields of Fubero work by S. Pearson & Son on the railroad, tanks, and 6-in. pipeline is progressing, the organization of the Cia. Mexicana de Petróleo 'El Aguila', S. A., to take over the greater part of the Pearson holdings having a dilatory effect on these contracts. It is believed the pipe-line of 91 km. may be delivering oil by September. By this contract the Oil Fields of Mexico Co. turns its entire product over to the Pearsons at a certain rate per barrel, to be agreed on each year according to the market, while S. Pearson & Son obligate themselves to construct a narrow-gauge railroad of 83 km. and a 6 in. pipe-line of 91 km. from Fubero to Tuxpám, with a tank at each terminus, all at an expenditure of from \$1,000,000 to \$1,250,000, which is to be paid for, with interest at 5%, by the Oil Fields of Mexico Co., at the rate of

10c. per barrel of oil delivered to S. Pearson & Son, who contract to receive a minimum of 2000 bbl. daily, the pipe-line having a capacity of 12,000. During the construction of the pipe-line and railroad no further development will be made of the oilfields, but as the existing wells have a productive capacity of 20,000 bbl. per day there is no great present need for additional boring.

Report has it that E. H. Harriman, whose work in the Mexican oilfields is being closely watched, has struck oil at El Jobo, near Tuxpám, at a depth of 2900 ft., the oil having an asphalt base similar to that of S. Pearson & Son's farther up the Tuxpám river, and drilling will be started immediately on a second well. Many are of the opinion that the Standard Oil Co. is coming into the Mexican field to assist the Waters-Pierce Oil Co. in the competition which it is meeting from the antagonistic S. Pearson & Son, or



San Rafael Mill, Pachuca.

the Compañía Mexicana de Petróleo 'El Aguila' S. A. The latter has a strong Mexican backing.

Ever since the successful promotion and sale by the MacDonald Bros. of the Real del Monte of Pachuca, endeavors have been made to carry through a like deal with its near neighbor, La Blanca. Several options have been taken, only to fall through, though one was said to be to John B. Farish, of Denver. Now it is stated that another option has been given to Hugh Rose for Cortlandt E. Palmer, representing New York capital, and John Hays Hammond, backed by London investors. A complete examination for those interested has been made by F. W. Royer. The figures at which the option is held are not made public, but they are thought to be well up in the millions. If carried through it means more large cyanide plants for Pachuca.

GUADALAJARA, MEXICO.

Cinco Minas Sold.—Magistral Copper.—Casados Mine.—Sombretete.—Guadalupe de los Reyes.—San Geronimo.—Government Subsidizes Shaft-Sinking.

John B. Farish, of Denver, has made an examination of the Cinco Minas, famous *antiguas* in the Hostotipaquillo district of Jalisco, and as a result of his report the deal for the purchase of the mines by the Marcus Daly interests for \$530,000 will be carried out. Mrs. Daly, head of the Daly estate, has made another payment on the purchase price, and has advanced considerable money for further development and for mining machinery. The Cinco Minas deal has been held up since last April, when Ernest A. Wiltsee, a New York mining engineer, sent to Mexico by the Daly estate, made an unfavorable report on the properties, recommending that the purchase be not made. In his report Mr. Farish reverses the Wiltsee finding, and sustains H. E. Crawford, the New York engineer who interested the Daly estate in the mines, predicting even a more important mining enterprise than pictured by Mr. Crawford. The new development in the mines, which has been in progress since last fall, has resulted in finding considerable rich ore and in opening big bodies of milling ore below the old workings, and in disclosing virgin ground at the same levels as previously worked. A five-stamp experimental plant will be erected at the properties, and later a 250-ton

plant will be built. The Cinco Minas have a recorded production of many millions. Patrick Clark, of Spokane, Washington, is no longer connected with the Magistral copper enterprise in the Ameca district of Jalisco. His interests have been purchased by James P. Harvey, H. L. Percy, and Fred M. Lyons, all of Los Angeles, California, and they are now in control. The Magistral-Ameca Copper Co., capital \$1,500,000, has just been organized in the United States to operate the properties, and of this company Mr. Percy is president, Mr. Lyons vice-president, and Mr. Harvey general manager. The transfer of the Clark holdings resulted from a disagreement between the Spokane man and his three partners over the distribution of stock and the management of the proposed American company. Clark and the Los Angeles men arranged an option on the Magistral mines two years ago, and last fall purchased them for \$100,000, organizing a Mexican holding company to receive titles and carry on the work. The ore now in sight in the mines is estimated to have a value of \$1,200,000, and a 150-ton reverberatory smelter will be erected at the properties within the next few months. The Sombrerete Mining Co., of which Robert S. Towne is the head, is planning the installation of a big hydro-electric plant on the Durango river in the Sombrerete district of Zacatecas, and the transmission of electric current to the mines and reduction plants in the Sombrerete, Nieves, and Chalchihuites districts. Hydraulic surveys have shown that from 8000 to 10,000 hp. can be generated. The Towne interests are extensive in the three districts, and electric power would give great impetus to mining and milling in that portion of Zacatecas. Considerable rich ore is being taken out of the Casados mines in the Hostotipaquillo district of Jalisco, and from two to three carloads are shipped to the smelter monthly. The returns range from \$3000 to \$7000 per car. The milling ore opened in the Casados warrants the erection of a reduction plant, and one of 100 tons capacity will be built during the next year. The mines are owned by the Consolidated Mining Co., W. R. Ramsdell, president. The Guadalupe de los Reyes Mining Co., one of the most important mining concerns in the State of Sinaloa, has practically decided to build a power plant on the line of the Southern Pacific extension and to transmit current to its mines and reduction plant, a distance of 68 kilometres. The company is now generating electricity by steam at the properties, and is standing a heavy fuel charge, which can be greatly reduced by having a power plant on the railroad. The 30-ton mill and concentrators of the Lawson Development Co., on the San Gerónimo hacienda in the Mascota district of Jalisco have been placed in commission, and are operating on ores from the company's mines and from other Mascota properties. More than a year ago the Lawson company, which is headed by Thomas W. Lawson, and managed by Frank W. Page, made plans for extensive mining development in the Mascota district, and secured options to purchase several mines. However, the plans were not carried out, and the options lapsed, but another effort may be made soon to put at least some of the plans into effect. The Makeever transportation tunnel of the big El Favor mine in Hostotipaquillo district of Jalisco has cut the main vein of the property at a depth of 750 ft. The vein is 55 ft. wide where cut, and the greater part of it is milling ore. All the levels of the mine are being connected with the Makeever tunnel, and all ore will be sent through it to the 100-ton mill now building. Work has been resumed on the Nueva Luz shaft of the Mineral Development Co. in the Guanajuato district of Guanajuato, and the present depth is 1175 ft. The company is now receiving from the Mexican Government a subsidy of \$150 per metre, the subsidy having become effective when a depth of 500 metres (1640 ft.) was reached. The shaft will extend into the earth 3000 ft., and at that depth a cross-cut will be run to tap the Veta Madre, or mother lode, of the Guanajuato district. The Government is interested for the reason that the shaft will serve to prove the Guanajuato district at great depth. The Guanajuato Consolidated Mining & Milling Co. has installed a filter at its cyanide plant in the Guanajuato district, and announces a saving of \$18,000 per month as a result.

WASHINGTON.

Senate Tariff Bill Passed.—Experiment Stations.—Alaska.

The tariff bill finally has passed the Senate. The conferees are now holding protracted sittings in hope of harmonizing the downward revision of the House with the upward revision of the Senate. When they get through, the action of the Senate, with probably few minor exceptions, will be the law, for the Senate always has its own way in matters of serious legislation. The House likes to play the political game to that large gallery, the American people, at the same time believing that what the people often demand loudly is not good for them, and that the Senate can be trusted to eliminate the hurrah things that have crept into the bill. N. B. Aldrich, Senator from Rhode Island, and chairman of the Finance Committee, evidently holds that the people in their clamor for downward revision were wrong, for practically every schedule he has offered has lost sight of this important issue of the last campaign. The Senator from the little State has been an ideal person to carry out such a program. His constituency is such that he is assured a life position in the Senate. No storms of popular indignation ever beat about his head. Rhode Island is proud of its big man who knows how to keep his head under the most trying circumstances, who knows how to forget his personal feelings in the great task of making a new tariff. Mr. Aldrich has been bitterly assailed at times, both by Democrats and Republicans, because of his firm stand for a high tariff, but in the midst of the most scathing denouncement of his dictatorial methods, and they were dictatorial, his ears have been deaf to the personal comment, and have only heard the suggestions that went to carry out his original program. There is discussion throughout the country as to whether Mr. Taft will sign the tariff bill. There is no doubt here but that the bill will become a law. The argument is being advanced that if the present prosperity continues and increases, the people will forget the downward revision promise in the good times; if the business of the country gets bad, the Republican party will be defeated in the next election and would be defeated whether the tariff bill was high or low.

The last day of the hearing on the tariff bill saw the independent oil men of the country gain a slight victory. Crude petroleum remains on the free list, but an amendment has been added which provides a countervailing duty. The smelter-fume nuisance was attacked from a new point when arsenic was placed upon the dutiable list. The effect of the Senate provision for a tariff of 60c. per ton on screened coal and 15c. on screenings is being much discussed. On the one hand it is urged that this is necessary to protect the coal miners of Utah, Washington, and Wyoming against Canadian competition on the Pacific Coast, and to hold the markets of New England for West Virginia and other Eastern bituminous producing States. It is pointed out, however, that despite present prices of \$1 to \$1.65 per ton less for Canadian coal than for that from the Virginias, the high quality of the latter enables it to practically control the market. It is idle to guess as to results till the Conference Committee decides what the tariff is, but the fact seems to be that S. B. Elkins and his fellow owners of West Virginia coal mines want as high a price for their coal as they can get, and that Mr. Aldrich has made this concession a matter of trade for votes. An interesting provision of the bill is a drawback to be paid when the imported coal is used on steamers of American register engaged in foreign or coastwise traffic.

Thomas H. Carter, Senator from Montana, has introduced a bill in the Senate to establish 'The Glacier National Park', in the Rocky Mountains south of the international boundary and in the State of Montana. The same Senator also introduced a bill providing for the appointment of an inspector of mines for the District of Alaska. Mr. Carter also has a bill to establish engineering experiment stations at land grant colleges. Each is to be entitled to \$30,000 yearly. The report of the Geological Survey on Alaska for 1908 has just been issued as Bulletin 379.

DAWSON, YUKON TERRITORY.

Summer Work. — Yukon Gold. — Quartz Mining. — White Horse. — Caribou Crossing — Windy Arm Mines. — Atlin.

Summer is here, and the profusion of roses and fresh vegetables emphasizes the fact. Only the newcomers who step off the steamers with heavy blanket rolls and wearing winter clothing, remind us that we are in the Far North. There are many idle men now; some are being fed by the city government. Aside from the work of the Yukon Gold Co., not much is being done near Dawson this season. That big company is working at high pressure, trying to make the most of the present season. All their dredges are in operation and a good season's return is expected. Quartz mining is attracting some attention, and indeed certain of the veins look promising. One stamp-mill is being erected, but the real need is for a satisfactory dry process. Any form of wet crushing and concentration is bound to fail, since in the winter the machinery would inevitably freeze. The roads near Dawson are in excellent shape, and this greatly facilitates such work as is being done.

At White Horse, Greenough Bros. of Spokane have taken options on a number of copper claims, among which are the Pueblo, belonging to Byron White, and the Arctic Chief group, partly developed by W. J. Elmendorf. Plans are being made for important work.

The White Pass & Yukon railroad runs along the east bank of Lake Bennett, at the foot of which is Caribou Crossing, a narrow channel that forms the outlet of Lake Bennett into Lake Tagish. An arm of the latter extends southerly a distance of 50 miles, thus making a peninsula 20 miles wide between Lake Bennett on the west and Lake Tagish on the east. The northern portion of this peninsula is indented by Windy Arm, which has a length of 10 to 12 miles. The projection of country lying between Windy Arm and Lake Bennett, about 10 miles in width, is officially designated Windy Arm district. On the Windy Arm side is the town of Conrad, which is about 12 miles by boat from the railroad at Caribou Crossing. Near this place is the Venus mine, belonging to the Yukon District Gold Mines Development Co., in which Col. J. H. Conrad, E. E. Harvey, and their associates are interested. The property is 1750 ft. from the wharf, at an altitude of 1000 ft. above the lake level. It consists of a well-defined vein in a porphyritic country, which is opened by cross-cuts from the mountain slope. The vein has an average width of 3 ft., on which there is, approximately, 1000 ft. of driving in ore. The gangue material is quartz, carrying in the main an argenterous galena, accompanied by some arsenopyrite and chalcopyrite; in the higher workings are lead carbonate and malachite in small quantity. All these ores contain some gold. It is said the silver, lead, and gold have a gross value of \$25 per ton. No. 1 cross-cut goes in 60 ft., where it strikes the vein, on which there are 170 ft. of driving at this level. No. 2 cross-cut intersects the vein 496 ft. from the portal and 272 ft. below No. 1 on the dip of the vein. On this level there is 400 ft. of driving each way from the cross-cut. Besides this, raises have been made and stopes opened at various places. Most of this work was done under direction of W. S. Whitman, who states that 3500 tons of ore have been stoped out above this level. They operate air-drills, the air-compressor being driven by water in the summer season. An aerial tramway conveys the ore from the mine to the mill, the latter situated near the wharf. The mill was operated last season, but has not been started this season, and it is said some changes are contemplated. The equipment comprises a crusher, two sets of rolls, jigs, Huntington mill, Wilfley tables, and vanners. R. R. Hornor is superintendent, and has a force of miners developing the property.

The Big Thing property, belonging to the British Yukon Gold Mining Co., is situated on the Lake Bennett slope of Windy Arm district, six miles from Caribou Crossing. It consists of a series of parallel lodes in a body of granite that lies between porphyry and limestone. The company's development is thus far confined mostly to one of these lodes, which has a gangue of quartz and altered granite. It has a dip of 30°, and the plan of development is to sink

shafts, or inclines, on the lode and run drifts from them. There are several hundred feet of work of this character. The width of the lode is not definitely fixed, as the ore gradually fades into the country rock. The principal metal is gold, though there is a good deal of silver, all carried in quartz and iron pyrite, accompanied by none of the other base metals. The ore is said to run over \$20 per ton. The matter of erecting an aerial tramway, 3¾ miles long, to carry the ore to the railroad, is being considered. As the ore is believed to be adaptable to cyanidation it may be decided to treat it at the mine. Those responsible for the operations and results are J. H. Conrad, H. W. Vance, and W. S. Whitman.

Caribou Crossing is the place from which the steamboat *Gleaner* makes semi-weekly trips to Atlin, by way of Tagish lake and Taku inlet, there being a portage railroad from the latter to Lake Atlin.

BUTTE, MONTANA.

Amalgamated Changes. — Ray Consolidated Sale. — North Butte. — Pittsburg & Montana Foreclosure.

The Butte mining companies, especially those of the Amalgamated Copper Co., are still trying to reduce costs. They are now experimenting for the purpose of substituting electric power for steam in transportation, and Nordberg engines are proposed. John D. Ryan, president of the Amalgamated Copper Co., says the change will reduce the cost of production fully one-third of a cent per pound. Mr. Ryan has great faith in the future of the Butte mines and in the future of the copper industry. He is not at all disturbed by the increasing production of the metal, and predicts still greater production and higher prices for copper. He calls attention to the fact that during the year ending July 1 the Amalgamated company paid \$6,400,000 in freight charges, \$15,000,000 in wages, and \$10,000,000 for supplies. During the same period the Butte district produced 325,000,000 lb. of copper. Mr. Ryan has declined to discuss the rumors that plans are on foot to take all of the Cole-Ryan companies into the Amalgamated company. It is a well known fact that Mr. Ryan and William Rockefeller have always favored a policy of expansion. H. H. Rogers, it is understood, was against that plan. His idea prevailed and the North Butte, Butte Coalition, Greene-Cananea, etc., were organized as separate units. It is predicted that when the time is opportune a consolidation will be effected and that the Guggenheims and Morgans will be found to be working in harmony with the new Standard Oil copper management. George W. Perkins, on his way to visit the Guggenheim and Morgan copper fields in Alaska, stopped at Butte as the guest of Mr. Ryan.

R. D. Grant and Philip Wiseman, formerly of Butte, but now associated with the American Development Co., at Los Angeles, have sold their interest in the Ray Consolidated Co., to Bernard M. Baruch, representing the Guggenheims, for \$1,100,000. Grant and Wiseman promoted the Ray company, whose property is situated in Arizona. W. D. Thornton, president of the Green Consolidated Co., has been in Butte for several weeks, in consultation with Mr. Ryan, president of the Amalgamated company. The policy of the North Butte officers would seem to strengthen the general fear of stockholders and reports from the mine that the property is gradually deteriorating, or at least is not keeping up its former record. Strict orders have been issued that no information of any character shall be given out in Butte.

The property of the Pittsburg & Montana Copper Co. is in the hands of two receivers, R. T. Rossell having been appointed at Pittsburg and Oscar Rohn at Butte. The latter is manager of the company, and under orders of Judge Hunt, of the Federal Court, he will continue operations pending mortgage foreclosure proceedings. The foreclosure is part of the plan to turn the Pittsburg & Montana over to the East Butte Copper Mining Co. The foreclosure suit will be pushed to conclusion as rapidly as possible, and it is understood that there will be no opposition to the proceeding.

NEW YORK.

Greene-Cananea.—Zinc Output.—Boston & Goldenville.—Birkinbine's Report on Iron Ore Reserves.

The Greene-Cananea mine has now been operated by the new management for a little over a year. In this period the mining operations have been greatly extended, and the smelting plant has been re-arranged. While these changes were being carried on it was impossible to run the smelter at its full capacity. The smelter yielded 42,000,000 lb. copper, 957,770 oz. silver, and 6178 oz. gold in the period reviewed. The mine is now in first-class condition, and L. D. Ricketts, the manager, reports that the smelter is giving satisfaction. During the current year larger returns are expected, as it is proposed to blow in the whole eight furnaces shortly. In the past year only four were operated. The full capacity of the smelter is about 6,500,000 lb. of copper per month.

Notwithstanding that the markets for metallic zinc and lead are heavy, the output of the Missouri and Oklahoma zinc mines is increasing. The total shipments of ore from the mines of both States for the past 27 weeks were valued at \$7,000,000. The shipments during the last week in June contained 11,310,400 lb. zinc as blende, valued at \$244,247; 1,626,270 lb. lead, valued at \$46,498; 1,047,270 lb. calamine, valued at \$11,562. The total value of the week's yield was \$302,307. Many new mines are being developed, and prospects indicate a still larger output. An American company has acquired the Goldenville gold mines at Goldenville, Nova Scotia, and is preparing to develop them extensively. The company is known as the Boston & Goldenville Mining Co. Its main office is in Boston. According to the mine manager's recent reports, development is proceeding satisfactorily. Shaft-sinking and diamond-drilling are being carried on.

The statement has been frequently made to the effect that the United States Steel Corporation owns 85% of the iron ore in this country. This has brought forth a remarkable reply from Joseph G. Butler, Jr., of Youngstown, Ohio. Mr. Butler employed John Birkinbine to look into the matter, and he finds that the Steel Corporation owns 38½% of the available desirable ores, and but 3% of the whole. According to the figures of the United States Steel Corporation, the 'available' ores amount to 1,717,589,000 tons. Including all the iron ores of all kinds, amounting to 79,186,000,000 tons, and allowing that the United States Steel Corporation owns 2,322,434,000 tons, the actual percentage of iron ore in the United States owned by the United States Steel Corporation is 2.9% of the whole, instead of 85. The Corporation up to the present has no holdings whatever in the East, where on account of the electric concentrating process, the Lake Champlain and Adirondack district are rapidly forging to the front. Mr. Butler says he believes the output of these mines, together with the ore produced by the concentrating process in New Jersey, will in time equal the shipments from Lake Superior. The ores from the latter district are high in metallic iron, and for that reason are desirable and have the broader market. In 1907 the independent iron-ore producers mined and consumed 29,000,000 tons of ore, as compared with 22,000,000 tons consumed by the United States Steel Corporation. Mr. Butler predicts that within ten years, at least 10,000,000 tons of Cuban ores will be imported per annum and consumed on the Atlantic Coast. The deposits of iron-ore in Cuba are estimated at 600,000,000 tons. Mr. Birkinbine, in summing up his report on the iron ores of the East says: "It is very difficult to put an estimate on the quantity of unmined ore in the East, but a conservative estimate of the magnetite deposits alone would undoubtedly exceed 400,000,000 tons crude ore, with a present output of at least 2,500,000. This output is likely to be very largely augmented in the near future by the development of new properties and the increased output of existing deposits. Probably no other iron-ore section in this country has greater promise of development, for the reason that there are large areas of low-grade ores which have in the past laid dormant, but which can now be made available by magnetite concentration. As the Lake ores mined, owing to the increasing

demand, are each year growing leaner, and as no satisfactory method for their enrichment has as yet been discovered, the rich concentrated ores of the East are likely to be in increasing demand in the future for mixing with the Lake Superior ores, and thus raising the yield. Only one serious drawback stands in the way of a large development of these Eastern ore fields, and that is, being situated in close proximity to the seaboard, they will be peculiarly sensitive to the competition of cheaply mined foreign ores, especially as more labor will have to be employed in mining a sufficient amount of crude ore to produce a ton of concentrate and for milling same."

LOS ANGELES.

Union-Independent Producers Alliance.—New San Pedro Wharfage.—Palmer Gusher.

Events of large interest to the oil industry of California have been succeeding each other in quick order during the past three weeks. Following the announcement of the formation of the Producers Transportation Co., backed and financed largely by the Union Oil Co., came the still more important news of the alliance of the Union and Independent Producers agencies in a marketing contract. This alliance is to continue 10 years, the Union joining the agencies, putting its southern California properties into the Kern County agency, and its Santa Barbara, San Luis Obispo, and Fresno county properties into the Coalinga agency, reserving, however, all oil which is more valuable for refining than for fuel. The Independent Producers agencies appoint the Union Oil Co. their sole marketing agent for a period of 10 years, beginning February 1, 1910. The Union agrees to market all of the agencies' oil, make the collections and suffer all losses through bad accounts, for 10% of the net price of the oil at the well. The charges for the transportation of oil from all of the fields will be paid out of total gross receipts from transportation, making the net price received by the producer in the Kern River field the same as the net price at Coalinga or Santa Maria. Thus, while the cost of transporting oil from the Kern River district to the coast by the new pipe-line will be 22½c., and the cost from some of the Santa Barbara county fields will be 7c., the actual amount paid by the producers will be the same in both instances. The agencies agree to maintain their present production, so that the Union will be able to enter into contracts on a constant basis. Provision is made for an increased production on the part of the agencies. A board of arbitration, consisting of four members, two from the Union and one from each of the agencies, will have power to pass upon all matters of doubt concerning the provisions of the marketing agreement and to determine the action in any case not specifically provided for in the contract. W. L. Stewart and Danzell Stoney will represent the Union on this board, L. P. St. Clair the Kern County agency, and S. W. Morsehead the Coalinga agency. The importance of the combination outlined above will be realized when it is considered that of the approximate total of 160,000 bbl. of oil now produced daily in the State, 60,000 will be controlled by the Union-Independent Producers; this is 62% of the total fuel oil used in the State outside of that required by the railroads. Another move which will doubtless have far-reaching effect upon the marketing problem, is the acquirement by the Union Oil Co. of a controlling interest in the Outer Harbor Dock & Wharf Co. This company owns 156 acres of the San Pedro water-fronts, and expects to immediately spend \$1,000,000 in the development of wharfage facilities.

The famous Palmer gusher in the Cat Canyon field, east of Santa Maria was uncapped recently, and by actual measurement made slightly under 10,000 bbl. of oil in 24 hours. The production fluctuates somewhat, owing to variation in the gas pressure, but it will come close to averaging 10,000 bbl. per day continuously when left open. The oil issues from this well with a roaring sound, and has blackened the vegetation for 200 yards around. It is handled by the Union and Associated oil companies, each of which has a pipe-line running to the property from their main lines in the Santa Maria field.

BRITISH COLUMBIA.**Sheep Creek Mines.—Queen.—Nugget.—Kootenay Belle.**

Sheep Creek, in Nelson Mining division, is attracting more attention than any other gold-quartz camp in British Columbia. Though its regular production of gold is not yet large, there are in it two or three mines that are maintaining a steady output of gold-bearing ore from which profitable returns are being received, and several other properties are being prospected with promising results. The camp is easily reached from Salmo, and is distant about 30 miles from Nelson and 170 from Spokane. Mineral claims have been located on Sheep, Wolf, and Fawn creeks. That gold-bearing quartz occurs here has been known for years. R. G. McConnell and R. W. Brock in 1897 directed the attention of local prospectors to the occurrence of promising quartz veins. As a result, numerous quartz claims were staked, and a few were developed. Of the latter, the Yellowstone, on which a 10-stamp mill was erected; the Queen, and the Kootenay Belle, were worked with more or less success. Eventually the Yellowstone and Queen groups passed into the possession of Wm. Waldie, of Nelson, and the Kootenay Belle, after having been bonded to several others at different times, was acquired under lease and bond by men

**Mineral Resources of British Columbia.**

operating from Nelson, who during the latter part of last year milled nearly 2000 tons of ore in a 4-stamp mill, recovering gold to the value of about \$23,000 by amalgamation and \$14,000 from concentrates. The geology of the district, according to R. W. Brock, is as follows: "The veins at present being worked occur in a band of quartzites, slates, and schists, which extend northward from about Lost mountains across Sheep creek, at the forks of Sheep and Wolf creeks, and up the ridge between Sheep creek and Fawn creek. To the west is a wide band of crystalline limestone. Some granitic and aplitic dikes are intruded into the formation; also some basic mica dikes. The general strike of the rocks is about N.12°E., with a dip of 50° to the east. The veins are fissure veins cutting the formation, usually the quartzite."

The prominent properties of the camp are the Queen-Yellowstone, Nugget, Kootenay Belle, and Mother Lode. Besides these and other gold properties, there is the Emerald, which produces galena ore carrying 60% lead and a few ounces of silver. Last year's production at this mine was 426 tons, valued at about \$7000. The total production of Sheep Creek camp to date has been about \$800,000. The Queen vein is 6 to 11 ft. wide, probably averaging about 7 ft. It is regular and has unusually clean-cut walls. The ore is white milky quartz, with pyrite and pyrrhotite in about equal proportions. There is some galena, blende, and chal-

copyrite. These sulphides constitute about 8% of the ore. The value lies chiefly in the gold, more than 50% of which is saved on the plates. The main adit has been driven 600 ft. on the vein; there a shaft was sunk 200 ft., and from the bottom of this drifts have been run both ways. Ore from this lower level is being milled; its average value is \$12 to \$14. The 20-stamp mill is operated by water-power, also one Wilfley and three Overstrom tables, and two air-compressors—one a 10 and the other a 5-drill. Six Pelton wheels, 15 to 48-in., provide power.

The Nugget vein is also a quartz-filled fissure traversing the quartzite. It is as much as 14 ft. wide. The pay-streak shows high-grade ore, and is in places only a few inches wide, and in others several feet. Much of the vein material is oxidized quartz. The Nugget group of three claims is situated on Fawn creek, on the north side of the mountain which separates that creek from Sheep creek. The Mother Lode and several other groups are on the south side. The Nugget Gold Mines, Ltd., owns the Nugget group, on which there is a plant, including a 4-stamp mill, with boiler, engine, crusher, and two 6-ft. Frue vanners. A Pelton wheel and 600 ft. of 8-in. wire-wound wood pipe are to be installed this summer. There is a 2-bucket aerial tramway 1500 ft. long. Development includes three tunnels and drifts on the vein at three levels. A winze sunk from No. 3 gives a depth of about 350 ft. from the surface. Up to June 1, as a result of 18 months work, gold to the total value of about \$104,000 had been recovered. Between 500 and 600 tons of first-class ore, shipped crude, averaged about \$116 per ton, while 2750 tons of second-class ore, milled, ran about \$15 per ton.

The Kootenay Belle and Mother Lode are separate groups, situated on opposite sides of Sheep creek. The former is on the south side and adjoins the Yellowstone. On it have been found two parallel veins, 80 ft. apart, one ranging in width from 15 in. to 3 ft., and the other approximately 5 ft. They occur in quartzite and schists cut by aplite or quartz-porphry dikes. In the smaller vein wolframite and scheelite occur, generally near the walls, segregated into bunches or kidneys.

JUNEAU, ALASKA.**Alaska Treadwell.—Douglas Island.—Ketchikan District.**

The large Westinghouse turbines and boilers for the all-year plant of the Alaska Treadwell are expected within a month, and installation will begin immediately on their arrival. It is said that the Treadwell has now the best ore showing in its history. The management has been carrying on experiments for the past year in cyaniding, using a tube-mill and two tanks. The experiments have met with a good measure of success. There are 1200 employees, and 300 more will be put on as soon as the new power-plant arrives. A crew left for Nevada creek, Douglas island, June 17, to begin clearing up the ground and putting up buildings on the property of the Alaska Treasure Co. The mine will be operated this summer under the management of Mike Hudson of Douglas. A discovery of some importance was made on the Jersey group, on Douglas island back of the Treadwell mine. The property is owned by James Mitchell and M. O'Connor of Douglas and William Myers and S. Zinger of Juneau. Last month a rich body of ore was found on the claims of the Chichagoff Mining Co., of Sitka, operating on Chichagoff island. The strike was made in the new adit. A. M. Archangel, the superintendent, has left for San Francisco to purchase additional machinery. It is planned to do away with the present power-plant and install water-power, also to increase the capacity of the mill. At Auk Bay two small mills are to be built this summer. Little development has been done there, but the surface ores give high assay returns.

The Mt. Andrew Iron & Copper Co., operating in the Ketchikan district, made a shipment of 1550 tons of copper ore to the smelter June 19, and will have another ready June 30. The present output, it is stated, will be maintained or increased for an indefinite time. The Mt. Andrew mine now has ore in its new shaft. The Ketchikan district is experiencing a renewed mining activity and a shortage of machine men is reported by mine operators.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Josephinite is found in the placers along Josephine creek, in Josephine county, Oregon. It is an alloy of iron and nickel, containing 60.47% of the latter. When polished it has the appearance of iron or nickel. It is supposed to have been derived from the serpentine rocks of the region and concentrated in the gravels by stream-action.

Superficial high-tenor in copper does not prove that the ore will continue rich in depth. Copper is peculiarly subject to rearrangement by circulation of water through a deposit, and irregular concentrations are likely to result. Prophecy of probabilities requires the ascertainment of the local geological conditions by a trained observer.

Chain-grate stokers are widely used for burning small sizes of coal. In plants carrying uniform loads, where the stokers are properly set, there should never be any smoke. When the load is variable, faulty operation may result in emission of dense smoke. Plants equipped with these stokers can carry a variable load with excellent results if the thickness of fire, speed of the grate, and position of the damper be varied to suit the load.

Rope-drive power transmission may be calculated by a formula proposed by Edwin Kenyon, as follows:

$$\text{Horse-power} = \frac{V (24.6d^{12})}{4860 \times 1000d}$$

in which the horse-power is that transmitted by good 3-strand cotton driving ropes running over pulleys having diameters not less than 30 times the diameter of the rope, and where V equals velocity of the rope in feet per minute, and d equals the diameter of the rope in inches. The arc of contact is assumed at not less than 170 degrees.

Silico-manganese has been introduced as a substitute for ferro-silicon as a deoxidizer to remove occluded gases and oxides from steel, and as a vehicle for carrying either silicon or manganese into the steel. It is used in the open-hearth process, being introduced into the bath shortly before tapping. One advantage claimed for silico-manganese is that it contains practically no carbon, hence does not disturb the temper aimed at in the re-carbonization. Silico-manganese is a product of the electric furnace.

Steel in concrete not only remains clean and bright, but, if the grouting were perfectly done, it is freed from rust by the cement. Recent experiments by Ernest R. Matthews indicate that brickbats are as good as broken stone for the aggregate; that coke-breeze and slag are detrimental; that river sand is undesirable, especially when the concrete is desired to be water-tight; that coating the steel with cement grout previous to pouring the concrete insures protection to the steel; and that the use of oils on the steel reinforcement promotes rather than retards its rusting.

Dry storage of coal has no advantage over storage in the open except with high sulphur coals, where the disintegration of the pyrite facilitates combustion. Submerged coal does not appreciably lose in heat value, but the interest charge on plant and the charge for re-handling adds materially to the cost of the coal. Under-water storage of coal has so far been adopted mainly as a means of securing an adequate supply regardless of strikes.

Enrichment under arid conditions has operated in the Cloncurry district of North Queensland, Australia, to produce large outcrops of rich ore from small veins. In one case 3 ft. of ore at the surface yielding 28 to 40% copper was represented at a depth of 200 ft. by 18 in. with a few stringers of chalcopyrite. In another the ore, a red oxide, gave out at a depth of 10 to 12 ft. The large outcrop in this case was surrounded by small veins 6 to 20 ft. long and 2 to 12 in. wide.

Winter glaciers are accumulations of ice not large enough to persist through the succeeding summer. They are common along the streams of the Yukon-Tanana region, where, contrary to general impression, some water flows all winter in nearly all the streams. Where the channels become clogged this water freezes in masses 12 to 20 ft. thick. These accumulations of ice remain as late as July in sheltered spots, and it has been suggested that by using moss and brush to protect them from the sun, sufficient water might be stored to be of material service in gold washing.

Black sands contain a great variety of minerals, which average from about the specific gravity of tourmaline (3.12) upward. Owing to the similarity of specific gravity among the constituent minerals, the separation of the different materials in the concentrate is difficult. While the great majority of black sands contain nothing of value, there is always the possibility of finding platinum, cassiterite, monazite, and such substances, which would render treatment economical. Well known concentrators are applicable, and separation of iron-bearing minerals may be effected by suitable magnetic separators. It is always well to pan out samples of black-sands and have an investigation of their constituents made by a competent chemist.

Cloud-bursts—concentrated storms of great severity—sometimes take place suddenly in the mountains, in the hottest weather. A cloud may form about a peak, quickly grow dense and black, and be followed by a startling electric display. The lightning is followed by a torrent of rain, the character of the resulting flood depending on the relation of the storm to the topography. If it is concentrated in a canyon, the result is a violent and spectacular flood wave of great erosive and transporting power. If it is spread over an open slope there is a slower moving and less destructive 'sheet-flood'. A large amount of desert erosion, except that due to the winds, is accomplished during brief storms of this kind. Owing to their great irregularity the adequate protection of railways crossing deserts becomes a serious problem.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Co-Operative Topographic Surveys.

The Editor:

Sir—I note in your issue of June 19 the communication of G. O. Smith, Director of the United States Geologic Survey, relative to 'Co-Operative Topographic Surveys'. The difficulty that Mr. Smith has to meet in this matter must be recognized, yet the general dissatisfaction of those in charge of the work of the several States cannot be without some foundation. Unless there is some better arrangement possible than in the past, the present condition will result in dissatisfaction among the members of Congress from the States co-operating. Most of those familiar with the action of Congress relating to the several appropriations for the U. S. Survey for the past few years look upon the 'increase' in the present appropriation as a mere restoration, due to influences from the co-operating States. Many will differ with Mr. Smith in his belief that the claims of the public land States are paramount. The United States Survey is a National organization, and many will think the work should be apportioned, not with reference to Government ownership of lands, but rather with reference to the needs of such work where the greatest industrial developments are taking place, where they will be of immediate use to the greatest number of people. The 'practical' ones will say it should be apportioned in accordance with the taxes paid in the several States for National purposes, which is practically in proportion to the representation in Congress.

It seems clear that the United States fund should be apportioned without regard to whether there is co-operation or not, and if there is co-operation, then the amount of work done will be that much greater, and the United States Survey will get the benefit of it, in common with all others; but there seems no equity in cutting down the allotment in inverse proportion to the percentage of area already surveyed, especially where this increased percentage is due to the use of State funds in co-operative work. Some of the members of Congress have taken the position that the work of the United States Survey should be confined to the areas of public lands, or practically so, and that the several States, where there is no Government land, should do their own surveying, both topographic and geologic. Those who have been familiar with the several appropriations for the United States Survey know of the opposition to these appropriations, and also know that most of the votes necessary to pass them come from more populous co-operating States. The dissatisfaction which has appeared during the last few years with the work of the United States Survey has not been with the topographic work, which has been popular. One of the causes of this has been co-operation. There has been some talk even of a special appropriation for co-operative topographic work.

The whole matter is a complex one and requires careful consideration, but I fear the statement of the position of the United States Survey, and the considerations governing the same, will not prove acceptable to the co-operating States, the proposed allotment will not be regarded as equitable, and the change will lead to an unsatisfied public, reflected in the action of Congress on all the appropriations for the Survey. The position and the 'considerations' governing the Survey in the matter seem a compromise between the needs of those States where the great mass of the people live and the position of the members of Congress above referred to. I well know that Mr. Smith and the officers of the Survey have troubles of their own in working with insufficient appropriations, and with the pressure for work in so many sections of the country. I am not writing for the purpose of criticism, but to call attention to the facts as looked on by those interested in co-operation, with the hope that before the next session of Congress some plan may be evolved that will result in more harmonious action between the Federal Survey and the several State organizations, which will bring them closer together, and thereby maintain and increase the friendly feeling in Congress toward the Federal Survey. Whatever faults we find with the United States Survey are small, and we all need its help. For myself, I expect to do everything possible to help it in any way, even though Pennsylvania has been compelled in the last two years to return to her treasury money appropriated and unexpended by reason of the United States Survey not being able to meet it with an equal amount.

RICHARD R. HICE.

Beaver, Pennsylvania, July 1.

The Editor:

Sir—Concerning the new plan of allotting funds for co-operation in topographic mapping among the several States, announced by G. O. Smith, Director of the U. S. Geological Survey, in the MINING AND SCIENTIFIC PRESS of June 19, I would say that I heartily approve the general principle, since it assures a definite policy, and moreover gives the most work where it is most needed; that is, in those States where the least mapping has already been completed. The only criticism I have to offer is that in making up the percentage of areas already mapped, I do not think it is fair to co-operating States to figure as completed work the old, inaccurate, out-of-date, and abandoned style of mapping on the 1:125,000 scale in vogue 20 to 30 years ago, since all of this work, especially in the Appalachian area, is being re-surveyed on the 1:62,500 scale, and the cost is just as much as though no work had ever been done. The original work was merely a reconnaissance survey, and that of the crudest kind, so that while the old style maps were better than none, they do not reduce the cost of the re-surveys to any appreciable extent. I think this ancient and inaccurate mapping should not be counted in making up estimates of completed work in any State, especially in those where the people are willing to co-operate in paying half the cost of the modern and better map.

I. C. WHITE.

Morgantown, West Virginia, June 29.

Cost Sheet for Mines.

The Editor:

Sir—Frederic Irwin's criticism, July 3, of the cost sheet in the MINING AND SCIENTIFIC PRESS of June 5 is well taken. The language was a bit ambiguous. What I meant was, to include the cost of mining waste in the cost per ton of ore; in other words, to charge all mining, whether above or under the surface. All prospecting, stripping, development or actual ore-breaking would thus be charged to the number of tons of ore mined, which in most cases will be that actually milled or shipped. This is the 'ore'. In the proposed cost sheet this idea was adopted, the figures used were fictions, and a misprint was made in the total value of the ore. Mr. Irwin's objection is based on the wording of a sentence. The context agrees with his deduction. In his own communication, the expression, "the amount of waste should not be considered at all," might be criticised, did not the context suggest a particular and not a general application. For example, if three tons of waste be mined for one ton of ore, one of the objects of a cost sheet could then be realized by making a comparison of the system of screening in vogue with one where some of the then waste could be thrown into the ore. The cost per ton of both mining and milling might be lowered, and the net profit increased, or the change might be unprofitable. All low-grade mines go through this experimental stage. Sometimes, as at Cobalt, the waste rock accumulated in the development stage of the district becomes valuable ore when the milling epoch comes.

Perhaps some of your readers will give a different cost sheet for comparison.

ALGERNON DEL MAR.

South Pasadena, California, July 6.

Progress in Cyanidation.

The Editor:

Sir—An extract from the MINING AND SCIENTIFIC PRESS of January 2 has been brought to my notice, concerning an article by Alfred James on 'Progress in Cyanidation'. Even to a casual reader it would seem that Mr. James' criticisms are biased, in that he appears to favor the extensive use of a certain filtration process, and, in fact, he makes such extensive mention of this particular filtration process as to force upon the reader the conclusion that he may be directly interested in the introduction of that process. Apart from this, however, Mr. James makes an attack on the merits of the Adair-Usher process, which has done such practical work on the Witwatersrand. His criticism is made in a manner which is calculated to mislead the interested reader. Of his many inaccuracies I quote a few: (1) Mr. James states, "The Adair-Usher process thus becomes merely a method, not of solution, but of avoiding with the aid of decantation, a final transfer." This is untrue. The Adair-Usher process only requires sufficient agitation or circulation to dissolve the gold, and the treatment requires no transfer whatever after entering the treatment vat. Furthermore, no vacuum or any other filter is necessary, the charge being finished in this one vat, and is finally expelled therefrom to the dump with a residue that no cy-

nide manager need be ashamed of. (2) Mr. James states, "and sends to the dam an amount of solution containing not less than 4 to 6 grains of dissolved gold per ton, at least equal to the weight of tailing discharged." This our company challenges. The only way this could possibly occur would be by carelessness at the boxes and faulty precipitation, thereby allowing the washing solutions to carry gold. The average gold in solution in the Usher residue is, in practice, from 1½ to 2 grains per ton—a vast difference. (3) Mr. James states, "I saw dirty solution coming off the vats; surely evidence of poor work." This has no bearing on the process whatever. This criticism points merely to inattention and derelictions of the shiftsmen. (4) Mr. James states, "The charge was transferred and allowed to settle before washing started." This is not true. The charge is not settled before washing. The treatment is continuous, and no time is lost before washing is started. (5) Mr. James states, "From careful enquiries I could find no gain in extraction or decreased value of tailing resulting from the use of the Adair-Usher wash." This statement is also untrue, and I challenge Mr. James to disclose the name of the mine using the process, on which his "careful enquiries" were made, and we ask you to compare his answer with the list hereunder of the mines that acknowledge increased extractions alone, without taking into account decreased working costs or increased capacity:

RESIDUES OBTAINED BEFORE AND AFTER ADOPTION OF USHER PROCESS.

| Company. | Before. | | After. | | Saving. per ton. |
|---|---------|--|--------|--|---------------------|
| | dwt. | | dwt. | | |
| Champ D'Or G. M. Co., Ltd..... | 0.5 | | 0.35 | | 0 7½ |
| Crown Reef G. M. Co., Ltd. (treats 8000 tons per month, current and accumulated slime)..... | 0.46 | | 0.37 | | 0 5 |
| Durban Roodepoort G. M. Co. (treat 3850 tons per month on tribute) | 0.7 | | 0.25 | | 1 8 |
| Durban Roodepoort G. M. Co.... | 0.32 | | 0.20 | | 0 6 |
| Ferreira G. M. Co., Ltd. (treats 7175 tons fresh, 1681 tons ac- cumulated slime; total, 8856 tons per month; residues fre- quently as low as 0.12 dwt.; time of treatment, 72 hr.).... | 0.423 | | 0.223 | | 0 10 |
| Geldenhuis Estate & G. M. Co.... | 0.38 | | 0.16 | | 0 10 |
| Jumpers G. M. Co., Ltd. (treats 6000 tons per month current and accumulated slime) | 0.56 | | 0.36 | | 0 10 |
| New West Bonanza G. M. Co. (treats 375 tons per month) .. | 2.50 | | 0.75 | | 7 0 |

Also the Transvaal G. M. Estates treat 4400 tons per month, at a saving of £500. At this mine the time of treatment has been reduced from 5 days 8 hours to 3 days 14 hours.

As a sixth error I may cite Mr. James as follows: "It largely increased the bulk of solution to be handled, 5 or 6 of solution to 1 of dry slime." The ordinary ratio of solutions on the Rand by the old decantation method was approximately 5 or 6 to 1, and the use of the Adair-Usher process does not increase this ratio.

I think the foregoing remarks are sufficient to show that Mr. James' statements are entirely unsupported by facts. Had Mr. James asked our representative for information, this would have been

given him freely, but he appears to have preferred to form his conclusions without satisfying himself as to the accuracy of his information, which is a risky thing for an individual to do when he poses as an authority on such a technical matter as cyanidation.

Mr. James further states that he visited the Ferreira mine, and here again he seems either to have obtained inaccurate information, or to be guilty of a deliberate misstatement. The report of Mr. Hall, the cyanide manager at this mine, given below, supports this, from my point of view:

The slime dropped from collecting to agitating tanks, where it is agitated and circulated from two to five hours with solution 0.02% KCy. The pulp is then transferred to the Usher tanks. These are 6 in number—3 conical bottoms, 50 ft. diam., and 3 flat bottoms, 45 ft. diam., by 12 ft. deep. The average weight of a charge is 150 tons. In the Usher tank, solution is run through at the rate of 12 tons per hour for 36 hours. Another 36 hours is allowed for settlement, decantation, and discharge. The whole time an Usher tank is occupied with one charge is three days. The following table shows comparisons of results obtained during six months (January 1907 to June 1907) immediately preceding the installation of the Usher, and six months (November 1907 to April 1908) following the change. Results obtained during the transition period are not included:

| | Jan. 1907 to June 1907. | Nov. 1907 to April 1908. |
|----------------------------|----------------------------|-----------------------------|
| Average tonnage per month: | | |
| Current | 6,850 | 7,175 |
| Total | 9,032 | 8,856 |
| Value per ton, dwt.: | | |
| Original | 2.866 | 2.637 |
| Residue | 0.423 | 0.233 |
| Extraction, per cent..... | 85.25 | 91.54 |

It will be noticed that the average tonnage per month is less since the introduction of the Usher. This is entirely due to the fact that, through causes having no connection with the change in treatment, the amount of accumulated slime treated has decreased. Residues have frequently been as low as 12 pennyweights.

As to the practical and commercial success of the Adair-Usher process, which Mr. James has been at such pains to discount, may I conclude by recording the fact that H. Eckstein & Co. have recently purchased the entire rights of this process for the many mines under their control, at a substantial figure. This fact alone is surely a sufficiently convincing proof as to the value of the Adair-Usher process.

GEO. MACKENZIE.

Johannesburg, Transvaal, May 26.

Three regions in Alaska give promise of making important contributions to the copper market—Prince of Wales island, Prince William sound, and the Copper River-Chitina River region. The first two, which are near the sea, have produced copper for several years, but the third, which lies inland, is still in the prospecting stage. A report on this region by F. H. Moffit and A. G. Maddren has just been issued by the U. S. Geological Survey as Bulletin 374. Copper was the first mineral found in Alaska, and seems likely to be mined there in quantity.

VIRGINIA GEOLOGICAL SURVEY FOR THE SEASON 1909.

At the June meeting of the State Geological Commission held at Richmond, the following plans and appointments for the season's work were approved: (1) Continuation of the Virginia Coastal Plain surveys in co-operation with the United States Geological Survey, under the direction of W. B. Clark and T. W. Vaughan. Detailed work in the Coastal Plain province has been in progress for several seasons, and it is expected that by the close of the present season the field work for the entire area will be completed. (2) Continuation of the topographic and geologic surveys of the Virginia portion of the Virginia copper district. The four topographic sheets covering this area are being mapped in co-operation with the U. S. Geological Survey. The present season will allow the completion of detailed geologic mapping of the district by F. B. Laney of the State Survey, assisted by J. H. Watkins. The work will represent the most careful and accurate geologic study yet made of any part of the southern crystalline area. (3) Continuation of the detailed mapping and study of the Nelson county rutile area by T. L. Watson, State Geologist, and Stephen Taber. The work in this important, and as yet the only known commercial area of rutile in the United States, will be completed during the present season. (4) Continuation of the building stones work, under the direction of Mr. Watson. Special attention is being given the slate areas, of which there are four. J. S. Grasty is in charge of the work in the Arvonja and Snowden areas, Justus H. Cline is studying the Fauquier-Culpeper counties area, and S. L. Powell is investigating the Quantico belt, in Spottsylvania, Stafford, and Prince William counties. (5) Investigation of the iron ores of the State is being continued by R. J. Holden. H. D. Campbell is mapping the areal geology comprised within the Lexington, Natural Bridge, and Lewisburg topographic sheets. The chemical division of the Survey is in charge of Wm. M. Thornton, Jr.

Fluorspar mines in Illinois produced in 1908 34,918 short tons with a value of \$192,179, according to statistics collected by the State Geological Survey and the U. S. Geological Survey in co-operation and published in circular No. 5 of the former bureau. This was an increase of 9790 tons or 38.9% over the quantity produced in 1907, and an increase in value of \$50,208. There remained some \$7918 worth of unsold stock at the end of the year, and these figures are included in the production given. While the general business depression prevented the running of the mills at their maximum capacity, some impetus was given to the industry by the increased use of fluorspar in the manufacture of open-hearth steel. Doubtless the development of the new plant at Gary, Indiana, will greatly increase the demand for fluorspar from the Illinois mines.

Sumatra mining is developing. A company has been organized to work valuable deposits of silver, gold, and copper in the Lampeng district.

PHOSPHATE DEPOSITS OF UNITED STATES.

Written for the MINING AND SCIENTIFIC PRESS
By FRANK B. VAN HORN.

*As a result of the recent 'conservation' movement, a good deal of attention has been directed toward phosphate rock and its importance in the welfare of the nation. When it is considered that many varieties of plant life cannot exist without the presence of phosphoric acid in the soil, the conservation of our deposits of phosphate rock becomes a question of great importance. Growing crops deplete the soil of its phosphoric acid, and if no steps be taken to restore it, the soil must eventually become non-producing.

The known phosphate deposits of the United States are distributed among four localities: (1) along the west coast of Florida; (2) along the coast of South Carolina; (3) in central Tennessee; and (4) in an area comprising southeastern Idaho, southwestern Wyoming, and northeastern Utah. In addition to these areas, some deposits occur in north-central Arkansas, along the Georgia-Florida State line, in North Carolina, Alabama, and in Mississippi, but these are mainly low-grade, and are not utilized at present. Besides these low-grade phosphates, according to Oscar H. Hershey, apatite rock ranging from 9.62 to 15.7% phosphoric acid has been found in connection with iron ore deposits in Eureka county, Nevada. Mr. Hershey estimates the supply at about 500,000 tons. Of the four producing fields, three have been worked from 14 to 30 years, while the Idaho-Wyoming-Utah field is a comparatively recent discovery which has had but a small output.

Phosphate mining began in the United States in 1867 in South Carolina. The existence of the rock has been known since 1837, but the possibilities of its commercial use were not recognized until 1859. From 1867 to 1888 South Carolina enjoyed a monopoly of the phosphate industry of the United States. In the latter year Florida came forward as a phosphate State, with a production of 3000 long tons. In 1904 the production surpassed that of South Carolina, and Florida has maintained its lead up to the present time. In 1892 phosphate was discovered in Tennessee, and two years later the production from that State was 19,188 long tons. In 1899 Tennessee went ahead of South Carolina, the production from the latter State having decreased steadily since 1894. The phosphate deposits range in age from the Ordovician in Tennessee to the Tertiary in Florida, occurring also in the Devonian in Tennessee and Arkansas, and in the Carboniferous in the Idaho-Wyoming-Utah field.

In Florida are three classes of deposits—'hard rock', 'land pebble', and 'river pebble'. These deposits vary in percentage of tricalcium phosphate from 78 to 80% in the hard rock, from 68 to 70% in the land pebble, to about 65 in the river pebble.

The hard rock phosphate belongs to the Eocene and the Miocene periods. In the former it consists entirely of a boulder deposit in a soft matrix of phos-

phatic sands, clays, and other materials, while in the latter it is also found at many places as a bedded deposit in place. The boulders vary in size from 2 or 3 in. to 8 or 10 ft., and lie embedded in all positions, surrounded by sand and clay containing considerable phosphate of lime in fine particles, resulting from a general distribution of the disintegrated portions of the boulders during deposition. The deposits themselves vary from small pockets to those several acres in extent. The phosphate content of this class of deposit is from 10 to 30% of the mass.

The pebbles making up the land pebble deposits range from minute size to that of a walnut. They are originally white in color, but become dark colored



Phosphate Deposits in the Southeastern States

when subjected to the action of water. They are embedded in sand and are underlaid by a stratum of tough, stiff, clayey material known as 'bedrock'. Above the deposit is an overburden from 1 to 25 ft. thick, consisting of sand and limestone boulders. The proportion of phosphate to other rock of this class of deposit varies from 10 to 25 per cent.

River pebble phosphate is similar to the land pebble, and derives its name from its manner of occurrence in the river beds. The pebbles are white to dark brown in color, and of about the same size as the land pebbles. They occur in the form of bars in the rivers, and are derived from the formations through which the river flows.

In South Carolina the phosphate rock occurs in two forms: the land rock and the river rock, analyzing

*Published by permission of the Director, U. S. Geological Survey.

about 58 and 55%, respectively, in tricalcium phosphate. The land rock is probably of Miocene age, and consists of so-called 'pebble rock', which is in fact a solid mass from which the calcium carbonate has been leached and partly replaced by phosphate, leaving cavities which connect and penetrate the rock, giving it the appearance of being made up of separate pebbles. The rock is from 1 to 3 ft. thick and is overlaid by a green-sand marl. The river rock is so called because it is mined from the river channels. It consists essentially of the water-rounded fragments of the land rock.

In Tennessee there are three commercially important classes of phosphate rock—the brown residual phosphate, the blue or black bedded phosphate, and the white phosphate. These range in phosphatic content from 70 to 80% lime phosphate in the brown

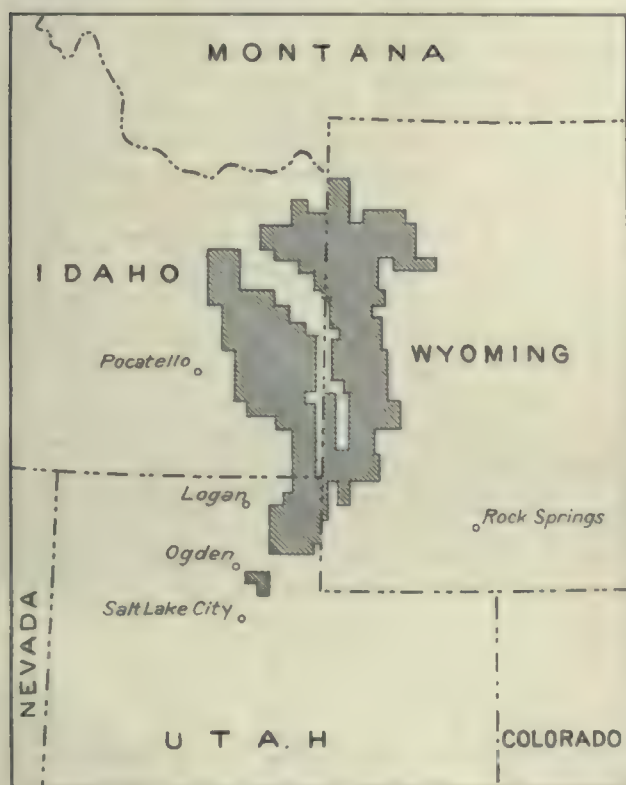
20 in. thick. The phosphatic content ranges from 30 to 85%. The nodular variety, which is embedded in a green-sand matrix, runs about 60% lime phosphate, but it is not practicable to work it except at points where the bedded rock is mined by stripping the overburden.

White phosphate rock is of post-Tertiary age, and occurs in three different forms—stony, brecciated, and lamellar. The stony phase contains usually only about 50% of lime phosphate, and is not worked at the present time. The lamellar forms were deposited in caves, and are thus of irregular shape and extent. The breccia consists of fragments of Carboniferous chert cemented by lime phosphate. The chert fragments vary from a fraction of an inch to 3 or 4 in. diam. The lamellar variety consists of thin parallel layers or plates about 1 in. thick, but several inches long and broad. The white phosphate has thus far been found only in Perry and Decatur counties. It contains sometimes as much as 85% phosphate of lime.

Within the last few years a large area of phosphate-bearing rock has been discovered in the western United States. This discovery is of much importance, since it opens a new field in an area tributary to great agricultural regions. The phosphate occurs over a considerable area in southeastern Idaho, southwestern Wyoming, and northeastern Utah. It is found in rocks of Upper Carboniferous age in a series of shales and limestones, 100 ft. thick, within which are several beds of phosphate rock ranging in thickness from a few inches to 10 ft. At the base of the series is a limestone, and 6 to 8 in. of soft brown shale separates this from the principal phosphate bed, which is 5 to 6 ft. thick. This phosphate bed is oolitic in character, and is high in phosphoric acid. There are in the series several other beds ranging from a few inches to 10 ft. thick, separated by thin beds of limestone or shale. Usually one and sometimes two of these beds at a given section are workable, and probably some of the others will eventually be mined. The lime phosphate content in the workable beds varies from 65 to 80%, with an average of 72. The newness of the field, the lack of transportation facilities, and the high freight rates have prevented the development of this phosphate territory to any great extent, although there has been some shipment from Montpelier, Idaho, in the last three or four years. According to F. B. Weeks,[†] who recently prepared a preliminary report upon these phosphates. This field embraces the largest area of known phosphate beds in the world, and at some future time it will doubtless furnish a large part of the world's production of commercial fertilizer. The development of intensive farming as a result of the reclamation of arid lands in the West will afford an increasing home market.

On December 10, 1908, acting under instructions from President Theodore Roosevelt, the Secretary of the Interior withdrew from entry all the public lands in the above three States believed to contain phosphate rock—about 7500 square miles. The list

[†]Contributions to Economic Geology, 1907, Pt. I; Bull. U. S. Geol. Survey No. 340, 1908, pp. 441-449.



Phosphate Lands in the West.

rock to 75 to 85 in the white rock, although in all three classes are to be found portions which run as high as 90%. The brown residual phosphate occurs mainly in Maury county. It is of Ordovician age, and is the result of the leaching process to which the phosphatic limestones have been subjected. Surface waters bearing carbonic and other organic acids have dissolved and carried away a large part of the calcium carbonate forming the limestone, leaving the tricalcium phosphate as a residual deposit. The brown phosphate is from 2 to 6 or 8 ft. thick at various points.

Blue or black bedded phosphate deposits are of Devonian age, and show variations from oolitic through compact and conglomeratic to shaly forms. There is also a nodular variety which occurs in a green-sand formation immediately overlying the black shale. The bedded deposit occurs in seams varying from 1 to 50 in. thick, but where carrying high-grade rock the bed is seldom more than

of lands withdrawn was furnished by the United States Geological Survey, as a result of preliminary examination. On June 1, 1909, the Survey placed a party in the field for the purpose of classifying these lands in detail and getting accurate knowledge of the deposits. It is not to be supposed that the entire area withdrawn will be found to contain workable phosphate, and at the end of the present field season some of the withdrawn territory will undoubtedly be restored to entry. Furthermore, knowledge concerning the extent of the phosphate deposits of the West will be in a much more advanced state than at present.

The total production of phosphate rock in the United States from the beginning of the industry to the end of 1908, by States, has been as follows:

| | Tons. |
|----------------------|------------|
| South Carolina | 12,138,454 |
| Florida | 14,087,833 |
| Tennessee | 5,315,422 |
| Other States | 52,570 |
| Total | 31,594,279 |

Owing to incomplete data, any estimate as to the available supply of phosphate rock must at best be unsatisfactory. Sufficient work has not been done with the view of figuring supply to give a reliable estimate. It is known that the phosphate rock of South Carolina is practically exhausted; the Florida deposits have probably reached their maximum production; the output of the Tennessee deposits is on the increase, but this field alone would at the present rate of increase in production last but a comparatively short time. After the exhaustion of the Southern deposits there remain only those deposits of low grade already mentioned, and the large deposits of the public land States, upon which we must depend for the greater part of our phosphate in the future. Such estimates as have been made indicate the following reserve of high-grade phosphate rock in the United States:

| | Tons. |
|----------------------|-------------|
| South Carolina | 3,000,000 |
| Florida | 15,000,000 |
| Tennessee | 103,500,000 |
| Western States | 100,000,000 |
| Total | 221,500,000 |

It may be necessary to increase these estimates, and it is to be remembered that these figures are only for high-grade rock, that is, rock containing from 60 to 85% tricalcium phosphate. In addition, the vast amount of low-grade rock which is not now available will be in reserve, and some time before the exhaustion of the high-grade deposits we shall doubtless have begun to use this rock. The increasing price of the 60 to 80% phosphate will have a hastening effect on the utilization of the present low-grade material. The deposits of Arkansas, Georgia, North Carolina, Alabama, Tennessee, and the West, which run from 30 to 50% in lime phosphate, will be available to draw upon after the high-grade rock is exhausted. This class of deposits, especially in Tennessee and the Western States, will afford an enormous tonnage. The accompanying sketch maps show the areas in the United States in which phosphate rock is known to occur.

MANGANESE IN THE UNITED STATES.

A detailed report on the manganese deposits of the United States, by E. C. Harder, of the U. S. Geological Survey, is now in press. The preliminary paper, just out, contains notes on the sources and uses of manganese and the present status of the industry, together with brief descriptions of the principal localities where the ores are obtained. The manganese mining industry in the United States has for several years past been very small. In 1907, despite the general industrial activity, less than twenty manganese mines were in operation and not half that number operated steadily. The large manganese districts of the United States are in the Valley and Piedmont regions of Virginia, at Cartersville, and Cave Springs in Georgia, and near Batesville, Arkansas.

Manganese ores comprise the oxides and the carbonate of manganese. The most abundant deposits are in the Appalachian and Piedmont regions, in the southern part of the Mississippi Valley, and on the Pacific Coast. Manganiferous iron ores consist of a mixture of any oxide or the carbonate of iron with any oxide or the carbonate of manganese. They occur chiefly in the New England, Appalachian, and Lake Superior regions. Manganiferous silver ores consist of a mixture of manganese and iron oxides with small amounts of silver sulphide and lead carbonate, and in some places of gold. They are found in the Rocky Mountain and Great Basin regions. Manganiferous zinc residuum is obtained from the zinc furnaces in the Franklin Furnace district, New Jersey.

The chief producing States at present are Virginia, Tennessee, South Carolina, and California. In Virginia the principal deposits are in the James River valley near Lynchburg, on the west slope of the Blue Ridge from Front Royal to Roanoke, and in several belts in the New River region. The Tennessee deposits are the southward continuation of those of the Appalachian valley in Virginia, and occur mainly in Cocke, Unicoi, and Johnson counties. In South Carolina the most important deposits are near McCormick, in Abbeville county. The principal California deposits are near Livermore, in Alameda and Santa Clara counties.

The uses of manganese in the industries are metallurgical, in the manufacture of alloys and in copper and silver reduction, and chemical, as an oxidizer and a coloring agent. The principal alloys, spiegel-eisen and ferro-manganese, are used in various ways in the steel industry, the addition of small quantities of manganese giving to steel hardness, ductility, and strength. Manganese bronze is used for steamboat propellers, and other alloys are used for coins, statuary, and ornamental purposes.

Little manganese ore is now mined in the United States, the total in 1907 being only 5604 tons, against 209,032 tons imported, chiefly from India, Brazil, Cuba, and the East Indies. The average grade of the domestic ores is much lower than that of the imported ores and they require considerable treatment to prepare them for the market.

HISTORICAL GEOLOGY OF CALIFORNIA.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM FORSTNER.

(Continued From Page 582, June 10.)

Tertiary (Cenozoic).

Southern California. The lowest Eocene formation in southern California is the Topatopa, which consists of quartzite, sandstone, and shales, the former predominating in the lower and the latter in the upper portion. This formation occupies the heart of a large anticline, of which the eastern limit is the east wall of Sespe canyon, while westward it extends to Santa Barbara. It also forms the heart of Cayetano mountain. Characteristic Eocene fossils have been obtained from its upper portion.⁹⁶ The lower portion may be equivalent to the Martinez. The Sespe formation consists of sandstone and conglomerates, with thin bands of shale and occasional bodies of white limestone. The sandstone is generally of a reddish-brown color, except the white oil-bearing strata at the base, and a ferruginous, greenish-gray, calcareous sandstone in the upper horizon, which is the probable source of the oil in Tar creek. The major portion of the Sespe formation is certainly Eocene, but its gradual transition into the overlying Vaqueros renders it doubtful whether the upper portion may not belong to the Oligocene.⁹⁷

In the Santa Clara region (Ventura and Los Angeles counties) the Vaqueros consists principally of shale, generally with a basal formation of sandstone and conglomerate.⁹⁸ The Modelo formation overlies the Vaqueros conformably. It bears, both from a lithological and a paleontological standpoint, a marked resemblance to the Monterey. At its base is a massive, heavy-bedded, white to yellowish-gray sandstone, containing large concretions, and usually stained with petroleum. This sandstone forms a conspicuous horizon, distinguishing the underlying Vaqueros shales from the overlying similar Modelo shales. Within the latter is a member of light-colored sandstone.⁹⁹

In the Puente hills, southeast of Los Angeles, the Miocene is represented by the lower Puente shales, which may be Oligocene; the Puente concretionary sandstone; and the upper Puente shales. The Puente sandstone and the upper shales are also found in Los Angeles and along the flanks of the Santa Monica range. Along the Santa Monica range and in the Puente hills large masses of Miocene basalt are associated with the Puente formation. In the Puente hills the oil is principally derived from sandy strata in the lower Puente shale. At Los Angeles the productive oil-sands occur near the top of the Puente formation.¹⁰⁰

After the close of the Middle Miocene a general disturbance must have occurred in the northwest-

ern portion of southern California, causing a general unconformity between the Middle Miocene and the overlying Fernando formation. This formation extends from the Upper Miocene to the Pleistocene (see above, Coast range). It is possible to subdivide the formation locally, but over a considerable extent of territory these divisions merge into one another by insensible gradations. An unconformity generally marks the top as well as the base of the formation. It consists of a succession of conglomerates, sandstones, and arenaceous clays. At the Puente hills the formation carries considerable granitic detritus. In that district the Fernando has proved extremely rich in oil in several localities. In the vicinity of Los Angeles the basal portion of the Fernando consists of thin-bedded sandstone, overlaid by hard shale, rich in gypsum, in turn overlaid by sandstone, conglomerate, and shales, yielding Pliocene fossils. There is decided evidence of a break between the Puente Miocene white shale and the Pliocene strata, but it has not been determined what plane in the sequence of beds marks this period, because the usually discernible unconformity between the Monterey shale and the subsequent formations appears to be lacking. The arbitrary line between the Miocene (Puente) and the Pliocene (Fernando) has been drawn at the top of the uppermost layer of hard, white shale.¹⁰¹

In the upper drainage of the Santa Clara river the Tertiary rests directly upon the granitic rocks. These Tertiary formations are intercalated with lavas and tuffs, probably flows from a centre of eruption near the head of Soledad canyon. The lower formation (the Escondido series) is differentiated from the upper (the Mellenia) by the fact that the conglomerate of the former consists of granitic pebbles, while those of the upper are chiefly of lava derived from the lower series.

In the Antelope valley is a range of hills east of Rosamond, formed of rhyolite tuffs, intercalated with sandstone, remarkable for their brilliant colors. These are probably Tertiary strata, and form the Rosamond series.¹⁰²

Both slopes of the range on the peninsula are bordered by Tertiary strata. At Carizo springs, on the east slope, decided Miocene fossils have been collected. Eocene fossils have been found at a few points on the coast near San Diego. North of Santa Margarita creek the Tertiary forms the San Onofre mountains.

The northern portion of the Santa Ana range consists of Tertiary strata. The numerous eruptions of lava in southwestern California are of Tertiary age. At that time an uplift, accompanied by faulting, took place, and through the resulting fissures the lava-flows were erupted.¹⁰³ The conformation of the San Diego mesa, the San Pedro, and the San Clemente islands, prove that the sequence of the post-Miocene uplift, the long period of erosion, and the Pliocene period of depression, above set

⁹⁶Bull. No. 309, U. S. G. S., pp. 5-7.

⁹⁷Bull. No. 309, U. S. G. S., pp. 7-12.

⁹⁸Bull. No. 309, U. S. G. S., pp. 12-17.

⁹⁹Bull. No. 309, U. S. G. S., pp. 17-22.

¹⁰⁰Bull. No. 309, U. S. G. S., pp. 103-105 and 145-150.

¹⁰¹Bull. No. 309, U. S. G. S., pp. 106, 110, and 150-152.

¹⁰²Am. Geol., Vol. XXIX, pp. 350-365.

¹⁰³11th Rep. Cal. Sta. Min. B., pp. 76, 88, 96, 98, 113, 114, and 120.

forth as the geological sequence in the Coast range, also holds good on the coast of southern California.¹⁰⁴

Quaternary.

Sierra Region. The Pleistocene was, in its beginning a period of rest and erosion, during which the rivers cut their present canyons; then occurred extensive basalt-flows, which are found along the slopes of the higher Sierras, and to which belong the doleritic basalt of Mt. Ingalls, Plumas county. This basaltic eruption was the last volcanic activity within the Sierra Nevada, west of the summit.¹⁰⁵ This was succeeded by the Glacial epoch, during which the Sierra Nevada was covered by an immense snow-field, which probably stretched continuously from a little north of latitude 36° nearly to 40. The width of the snow-belt was irregular, but averaged from 10 to 15 miles. This glaciation was of an Alpine character; it had no connection with a northern ice-sheet. The remains of this Glacial epoch can be seen in the cirques and moraines of the higher Sierras.¹⁰⁶ Lower down the western slopes of the Sierra Nevada are found the Pleistocene river shore-gravels and Pleistocene lake-beds. The lower portions of the slopes were still beneath the level of the gulf waters, and thereon were deposited beds of gravel, hardpan, and clay, which cover an extensive area on the east side of the San Joaquin and Sacramento valleys; these in turn are overlaid by late Quaternary alluvium.¹⁰⁷

Northern California. In the Lassen Peak region volcanic activity has persisted during the Quaternary up to recent times. Mount Shasta has also been an active volcano during the late Quaternary. Its basalt-flows cover a large portion of Shasta valley and the country to the east, and the flow has run down the Sacramento canyon. The centre of the northern end of the Sacramento valley is covered by the Pleistocene Red Bluff formation, a fluvial deposit of gravels and sand lying unconformably upon the Tuscan tuffs and older formations, and in turn overlaid by late Quaternary alluvium.¹⁰⁸ During the Glacial epoch part of the Klamath mountains was covered by ice. Glacial remnants are found in the Yallo Bally, Salmon, and Trinity mountains; the amount of erosion since the ice disappeared is so small that the glaciation must have occurred in a late portion of the Glacial epoch.¹⁰⁹ As the Pleistocene was a period of uplift and erosion, no Pleistocene sediments are found in the Klamath region.

Coast Range, Including the Coast of Southern California and the Interior. A post-Pliocene epeirogenic uplift of the entire coast from Del Norte to San Diego has been fully established. In northern California this uplift amounted to 1600 to 2100 ft., and in south-

ern California from 800 to 1500 ft. This uplift occurred in stages, well marked by the terrace formations, which can be readily observed in the river valleys and on the coast. The satisfactory line of demarkation between the Pliocene and Pleistocene, on a purely paleontological basis, will probably never be formulated, and it appears more advisable for the Pacific Coast to draw the line of demarkation at the reversal from the epeirogenic Pliocene depression to the epeirogenic post-Pliocene uplift. During this Pleistocene period of uplift two remarkable local depressions took place, one at Catalina island, the other forming the bay of San Francisco.¹¹⁰ As the result of this stage-like uplift the Pleistocene marine deposits (Terrace formation) were spread over the terraces, representing deposits which accumulated off-shore at various stages of the emergence. They are composed of light-yellow sands, generally well stratified but not consolidated.¹¹¹ Apparently some volcanic activity must have occurred locally on the coast, for at Carmelo bay sheets of lava are intercalated in the earlier Terrace formation.¹¹² Within the northern Coast range are extensive basalt flows contemporaneous with those of Mt. Shasta above mentioned.¹¹³ On the coast of San Luis Obispo county is evidence that after the Pleistocene uplift a slow subsidence has set in, during recent times.¹¹⁴ In Santa Barbara county the Pleistocene consists of detrital deposits which cover the slopes at the base of the mountains, and marine deposits which skirt the coast; also of clays and fine sands forming terrace deposits mostly of marine origin, dune sands, and alluvium. The terraces fringe the coast-line and the valleys, and cover areas of low hills. Dune sands have been accumulating all through the Quaternary, continuing up to the present. The recent alluvium cannot be distinguished from the Quaternary alluvium. Near Summerland the Lower Pleistocene is oil-bearing in places.¹¹⁵ Neither in the Santa Clara valley nor at the Puente hills is the Pleistocene oil-bearing,¹¹⁶ but in the vicinity of Los Angeles the Pleistocene is in some localities impregnated with asphaltum.¹¹⁷ San Pedro, near Los Angeles, is the type locality for the fossiliferous marine Pleistocene on the coast, which therefrom has been given the name of San Pedro formation.¹¹⁸

During the last year the Antofagasta & Bolivia Railway Co. transported over its lines the following quantities of mineral products: nitrate, 382,800 tons, the output of 16 works or 'oficinas'; metals from the Huanchaca mines, 47,500 tons; tin and copper ores, 125,500 tons. These figures represent substantial increases over last year.

¹⁰⁴Bull. Dpt. of Geol. Univ. of Cal., Vol. I, No. 4, pp. 118-139.

¹⁰⁵Jour. of Geol., Vol. III, p. 411; and Folios 31, 37, 39, and 51, U. S. G. S.

¹⁰⁶8th Ann. Rep., Pt. I, pp. 327 and 328; Bull. Dpt. of Geol. Univ. of Cal., Vol. III, No. 15, pp. 357 and 366; and Folios 31, 37, 39, and 51, U. S. G. S.

¹⁰⁷14th Ann. Rep., U. S. G. S., Pt. II, p. 468; Folios 5, 18, and 43, U. S. G. S.

¹⁰⁸Folios 15 and 138, U. S. G. S.

¹⁰⁹Bull. No. 196, U. S. G. S., p. 58.

¹¹⁰Bull. Dpt. Geol. Univ. of Cal., Vol. I, No. 1, p. 57; Vol. I, No. 4, pp. 117, 128, 136-139; and Vol. I, No. 8, p. 242.

¹¹¹15th Ann. Rep., U. S. G. S., p. 463.

¹¹²Bull. Dpt. of Geol. Univ. of Cal., Vol. I, No. 1, p. 55.

¹¹³Mon. XIII, U. S. G. S., p. 223.

¹¹⁴Folio 101, U. S. G. S., p. 13.

¹¹⁵Bull. No. 321, U. S. G. S., pp. 33 and 35; and No. 322, pp. 69-70.

¹¹⁶Bull. No. 309, U. S. G. S., pp. 28 and 107.

¹¹⁷Bull. No. 309, U. S. G. S., p. 154.

¹¹⁸Prof. Paper, No. 47, U. S. G. S., p. 32.

DOES AN AUSTRALIAN KIMBERLEY EXIST?

Written for the MINING AND SCIENTIFIC PRESS
By JOHN PLUMMER.

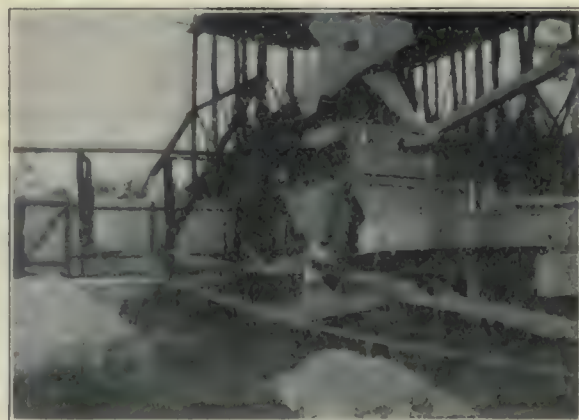
Since the first discovery of diamonds in New South Wales, over half a century ago, many thousands of small stones have been obtained in various parts of the State. The diamantiferous localities are numerous, but not the slightest trace of the source of the stones has hitherto been discovered. Small diamonds have also been found in Victoria and South Australia. In New South Wales the stones occur in Tertiary outliers representing old river accumulations. These are of more than one geological epoch. They lie at various distances from present river channels, and once formed portions of widespread and continuous deposits, resting on the bedrock of the country. The diamonds also occur in the recent gravels derived from the Tertiary deposits. About twenty years after their first discovery in New South Wales, extensive discoveries were made at Bingara, in that State, but the smallness and hardness of the stones made them commercially valueless. The larger dia-



Elevator at Diamond Washing Plant.

(with occasional rounded pebbles) of other rocks, such as clay-stone, amygdaloidal basalt, quartz-felsite, eclogite, etc., with garnets, chrome-diopside, magnetite, zircons, and a considerable quantity of secondary calcite." Systematic investigation led to the conclusion that Ruby hill is the denuded remnant of a volcanic pipe, formed, during Tertiary times, at the junction of an old intrusive quartz-felsite with the Carboniferous sediments. Subsequently the eclogite, which Australian geologists now almost unanimously regard as the actual matrix of the diamond, was much altered. Recently specimens of eclogite have also been obtained near Delegate, a New South Wales township close to the Victorian border. The rock is found at Kimberley in rounded masses having a singularly close resemblance to water-worn pebbles and boulders, and is coarsely crystalline and granular, the color being dark green, or almost black, showing some bright red garnets and other rare minerals. The resemblance between the Kimberley and Australian eclogite is sufficiently close to suggest a common origin.

E. J. Dunn, the Director of Geological Survey of Victoria, in a paper read before the Royal Geological



Australian Diamond Washing Plant.

monds are now readily cut with the assistance of diamond dust. Twenty years ago an official report stated that the New South Wales diamonds, in their physical characteristics, were more nearly allied to those of Brazil than to those of any other country, and that in color they differed but little from those of other fields. The general absence of 'cleavage' and 'maches' is a point in their favor.

Considerable diversity of opinion has existed with respect to the origin and true matrix of the Australian diamonds, but within the last few years it has become generally accepted that they will ultimately be traced to volcanic pipes analogous to those found on the Kimberley field. Recent discoveries, especially that at Rube hill, in the northern portion of the State, tend to confirm that conclusion. This hill on three sides exposes a volcanic breccia, which bears a striking resemblance to the volcanic agglomerate of the Kimberley pipes, the principal difference being that the local rock shows no sign of serpentinization. It has been decomposed to a depth of only a few feet, and in its undecomposed state it is of a dark greenish-blue color. "It is," we are told, "made up chiefly of angular fragments and masses

Society in London some few years ago, attributed the origin of the Kimberley diamonds to the beds of carbonaceous shale forming the walls of the volcanic pipes near the surface. He directed attention to the occurrence in all of the mines of considerable deposits of black carbonaceous shale underlying the beds of gray shale. These carbonaceous shales, according to Mr. Dunn, were over 100 ft. in thickness, and extended horizontally over the whole of the country in which the pipes existed. That the Kimberley mines are volcanic pipes, and that they burst through the carbonaceous shales, he regarded as evident, and in addition stated that it was found that the yield of diamonds in these pipes was greatest when mining was carried on in those portions of the pipes surrounded by carbonaceous shales, rendering it probable that these latter supplied the element necessary to produce the diamond, which is simply pure carbon. The pipes, it may be explained, extend to unknown depths, suggesting a chimney or vent from some deep-seated focus of thermal activity. It was supposed that the intense heat of the escaping lava bursting through the shales assisted in forming the diamond. The presence of eclogite in the Kim-

berley mines, combined with its discovery in New South Wales, where the carbonaceous shales are of such vast extent and thickness, especially in connection with the discovery of myriads of diamonds, the source of which has yet to be found, naturally suggests the possibility of an Australian Kimberley. On the other hand, it has been ascertained that diamonds are found below the limits of the carbonaceous shales. In the Kimberley mines exploratory work has been carried down to a depth of 1800 ft., while the carbonaceous shales, of Mesozoic age, do not extend more than 320 ft. below the surface. Notwithstanding this fact, diamonds are found as plentifully in the bottom of the mine as they were in the upper levels and above the carbonaceous shale. This has caused many to consider that the carbonaceous shale has nothing to do with the formation of diamonds. That diamonds are the result of volcanic action is unreservedly admitted. T. G. Bonney has expressed the opinion that the stones are probably derived from the destruction of rather coarse peridotites, pyroxenites, and eclogites. It is the presence of the latter, which is now beginning to be regarded as the real matrix of the diamond, in all the Kimberley mines, which causes its discovery in Australia to be regarded with such interest. In his work on the 'Minerals of New South Wales', E. F. Pittman, State Geologist, says: "It has yet to be proved whether the Ruby hill agglomerate contains diamonds in payable quantities; it may be that it does not, but the occurrence of one such deposit renders it extremely probable that others may exist, and that the presence of diamonds in the basalt-covered gravels of Boggy Camp, Bengara, and Cudgegong, is due to the denudation of these volcanic pipes, and the re-distribution of their contents in the drainage channels of the Pliocene age." The recent discovery of eclogite in the State would appear to confirm the view expressed by Mr. Pittman, who thinks, however, that the creeks in the vicinity of the alleged pipe should be examined, with a view to ascertaining whether there are any traces of diamond-bearing breccia.

GUNNISON COUNTY, COLORADO, MINERALS.

Some of the mining camps of southeastern Gunnison county, Colorado, recently described by J. M. Hill, of the U. S. Geological Survey, were discovered as early as 1878. The first rush of miners began in 1879 and 1880, and by 1881 the work in most of the camps was in full swing. By 1883 the production of the mining districts was estimated by the Director of the Mint as follows: Tincup, \$405,000; Tomichi, \$400,000; Quartz Creek, including Gold Brick, \$195,000. From 1903 to 1907 the statistics given by the U. S. Geological Survey in the annual volumes of 'Mineral Resources' show the production of the districts as follows: Box Canyon: gold, \$1351; silver, \$35; most of the output being in 1906 and 1907. Districts south of Tomichi creek: gold, \$41,384; silver, \$4257. The mines of this district were most active in 1903 and 1906. Gold Brick: gold, \$79,074; lead, \$6082. The years 1906 and 1907 show the greatest production, though this district has been a constant producer since 1903. Quartz Creek: silver, \$97,115; gold, \$4600; zinc, \$3452. From 1903 to 1905 the mines of this district were fairly active. In 1906 the production fell off, and in 1907 none of the mines were producers. Tincup: silver, \$30,198; gold, \$15,757; lead, \$6132. Up to 1906 silver was the chief metal saved. In that year, however, probably owing to improvements in treatment, the gold values show a big increase. Tomichi: lead, \$19,314; silver, \$13,219; copper and zinc, \$10.642; gold, \$1638. This has always been a silver and lead district, though in 1903 and 1905 some gold was recovered.

DRILL-LOG FOR PLACER GROUND.

The following table is taken from the log-book kept by William H. Radford in drilling a placer, and represents an excellent form for the purpose. The simplicity of the form is a meritorious feature. A log-book should be free from complications. The attempt to keep elaborate notes in the midst of the daily routine of testing is liable to lead to confusion and error.

Form for Keeping Drill Log in Prospecting Placer Ground.

| GOLD HILL FLAT. | | | | | | | | | |
|-----------------|----|----|----|-----------------------|-------------------|----|----|------------------------|----------------------|
| Aug. 8, 1908. | | | | | HOLE No. R. C. 6. | | | | |
| Depth, feet. | | | | COLORS AV. RECOVERED. | | | | CHARACTER OF GROUND. | REMARKS. |
| | A | B | C | L | M | F | S | | |
| 0—4 | .. | 48 | 27 | .. | .. | .. | 4 | Loam and top soil | R. C. 6 is 100 feet. |
| 4—5 | 10 | 12 | 12 | .. | .. | 1 | 48 | Fine gravel | N.W. of R. C. 6. |
| 5—6 | 10 | 12 | 12 | .. | .. | 1 | 35 | Fine gravel | |
| 6—8 | 12 | 24 | 40 | .. | .. | .. | 13 | Fine gravel | |
| 8—9 | 10 | 12 | 14 | .. | .. | .. | 2 | Fine gravel and clay | |
| 9—10 | 10 | 12 | 26 | .. | .. | 1 | 21 | Fine gravel | |
| 10—11 | 7 | 12 | 19 | .. | .. | 3 | 18 | Fine gravel | |
| 11—12 | 4 | 12 | 21 | .. | .. | 1 | 9 | Fine and medium gravel | |
| 12—13 | 4 | 12 | 20 | .. | .. | 1 | 25 | Fine gravel | |
| 13—15 | 16 | 24 | 21 | .. | .. | .. | 7 | Fine gravel and clay | |
| 15—18 | 10 | 36 | 25 | .. | .. | .. | .. | Bedrock | |

BEDROCK AT 15 FEET.

Depth = 15 ft. — 15 × 0.27 = 4.05 cu. ft.
A's recovered = 0.55 grains — 0.55 × 3.25c. = 1.79c.
132 in. driven in the pay-streak gave 185 in. of core.
132 in. = 0.71 — 1.79 × 0.71 = 1.27c.
185 in.
4.05 : 27 :: 1.27 : x.
x = 8.46c. per cu. yd.

R. C. 6 = 8.46c. PER CU. YD.

A = Number of inches drilled before driving.
B = Number of inches driven.
C = Number of inches of core in casing.
L = Large colors.
M = Medium colors.
F = Fine colors.
S = Specks.

ENGINEERING RESPONSIBILITY.

By CHARLES B. DUDLEY.

*Closely connected with the query as to the cause of failures is the oftentimes more important question, who is responsible for the failure? If the matter in hand is an experiment which we are making for our own information, the question of responsibility is small and is practically swallowed up in the cognate question of the cause of the failure. But if, on the other hand, the failure involves the loss of human life or the destruction of valuable property, the question of responsibility may be grave. The placing of the responsibility for failure is not always an easy matter. In our studies of failed and broken parts in connection with our work at Altoona for some years, we have been gradually led to ascribe failures to one or more of the four following causes: bad material, bad workmanship, bad or faulty design, or unfair treatment.

Bad material does not cover those cases where the wrong kind of material was used or material not adapted to the work. If cast-iron is used when steel should have been employed, if the steel is brittle when the service requires tough tenacious metal, this is no fault of the material. Failures due to the employment of material unfitted to the service come under another category. Nor can the material be blamed if the size of the part which fails is too small. This cause of failure also comes under another category. But material is bad, and may justly be charged with being the cause of failure when it is different from what those who put it in service had a reasonable right to expect it to be.

The query may naturally arise here, ought not the factor of safety employed to be sufficient to care for the uncertainties of material, so that the total output of a works could be made use of in service? Undoubtedly there is a necessary relation between the factor of safety and some of the uncertainties of manufacture, but it can hardly be allowed that the producer should throw upon the consumer all the uncertainties of material. I cannot help thinking the following definition of bad material is sound: Material is bad when it is different from what those who put it in service had a reasonable right to expect it to be. If the material is bought on specifications, it is reasonable that it should be what the specifications call for. And even if it is bought on indefinite, verbal, or written order, such material should be supplied as the buyer had a reasonable right to expect would be furnished.

But why is there ever any difficulty between the producer and consumer about material? The price is agreed upon when the order is taken and the quality of the material is either specified or understood. Why, then, does not the producer always furnish good material?

Our experience on this point has brought us face to face with several explanations of the difficulty we are considering. First, and perhaps most important, is the price. It is constantly urged that the consumer will not pay the price requisite to secure

the materials desired. No information is usually given as to how far the wished-for price, requisite to secure such good materials as the producer would like to furnish, covers a desire for large profits, and consequently consumers have always been a little slow to attach much weight to this excuse. Prices are largely determined by competition, and in the absence of something more than a verbal statement from the producer that better materials would be furnished at a higher price, he would be a bold purchasing agent who would pay the higher rate. On the other hand, it is undoubted that competition is the antagonist of quality, and where materials are bought without reasonable specifications rigidly enforced, there is unquestionably much weight in the contention of the producer.

Another reason or excuse for poor materials is that the processes and methods of manufacture do not always and every time yield the desired first quality product. Strive as the manufacturer may, the works always turn out some material that is inferior.

Another and most pernicious excuse for furnishing bad materials is the attempt on the part of producers to usurp the legitimate functions of both the consumer and his expert. This manifests itself in the statement, so commonly made by those furnishing material, that it is good enough for the purpose, thus arrogating to themselves the right to decide not only how the material shall be made, but also what kind of material the consumer and his engineer shall use. Pernicious though this custom may be, a good deal may be said in palliation of it. The practice is the outgrowth of a historical situation. In the earlier days, when the consumption of materials was only a fraction of what it is at present, the producer of any material was supposed to know not only how to manufacture it, but also its characteristics and how it would behave in service, and consequently consumers who in those days had scarcely begun to study for themselves the behavior of materials in service, naturally turned to the manufacturers for counsel as to what materials to use.

The second cause for failure in structures, bad workmanship, is a far too frequent cause of failures. The tendency to slight the job is almost universal. A rivet or a bolt is left out, with consequent increased strain on those which are actually put in, a forging does not fill out the pattern, or the metal is burned, or a weld is defective. No doubt many will claim that inferior or insufficient compensation is the most fruitful cause of poor quality of work at the hands of those who, in our industrial system, play the part of hewers of wood and drawers of water. But the experience of the last few years has not seemed to confirm this view. If this was the real explanation it would seem to follow that voluntary increase in wages would bring an increase in efficiency. In fact, the increase in efficiency following voluntary increases in wages has been most disappointing. We must apparently look further for the real reason for poor workmanship.

The method of compensation for work performed has a direct and most important influence on the quality of service rendered. I refer especially to the

*Presidential Address delivered before the Am. Soc. Test. Materials, June 29.

piecework system in those places where it is applicable. This stimulates output at the expense of quality, and it is not at all strange, perhaps, that after constructions have found their way into service, we should not infrequently find evidences of the haste, the slurring over, and the inferior workmanship which these methods have necessarily done so much to stimulate. I am not at all prepared to suggest any substitute for them, and am, and have been for many years, an advocate of them from the standpoint of successful management; but it is folly for us to close our eyes to the fact that the piecework and other successful output methods of compensation are antagonistic to quality of work, and that, despite all our efforts to the contrary, they may justly be held responsible for some of our engineering failures.

One more phase of the workman problem. Close observers of the modern workman have noticed for some years a growing tendency on his part to manifest less and less interest in his work. *Esprit de corps*, pride in his work, and a genuine feeling of loyalty and devotion to the establishment of which he forms a part are gradually becoming less and less. The allegiance of the workman, under the influence of the ferment and agitation which now pervades our whole industrial system, is gradually passing over, in a measure at least, to the labor organization. The effect of this transfer of allegiance on the quality of the work performed needs no elucidation.

Third, it is evident that the engineer who makes or finally decides upon the design of any structure carries a heavy load of responsibility. He is first in the field and practically tells all who follow what is to be done. He must decide not only the kind of material that is to be used, but also the amount or sizes, and how it shall be disposed. His realm embraces every kind of structure, from the foundations of a bridge or building to the most minute details of a locomotive or car. His knowledge of the properties of materials must necessarily be broad and comprehensive, and the field is so enormous that there are naturally numerous specialists. The engineer who makes the design labors under two very serious difficulties. First, it is not possible, many times, to compute the strains to which the whole or parts of the structure will be subjected. He, perhaps more often than any of us, is at the end of his knowledge, and if failure due to defective or faulty design comes, he deserves more sympathy than anyone else involved.

But the designer labors under another serious difficulty. He is often overruled and prevented from doing what his judgment prompts him to do, in the interests of safety, by those who control expenses. The construction he would like to use costs more, and the management for economic reasons demands something less expensive.

Fourth, unfair treatment. As already indicated, there is a natural disposition on the part of each of us to relieve ourselves from blame and put the fault on someone else, and there is no field of parcelling out deserts among those involved in failures, and the responsibility therefor more fertile than this one of unfair treatment. Far be it from us to say that unfair usage is not many times a legitimate explanation of failures.

There is, however, another phase of this part of our subject. Unfair treatment is very much broader than the obvious misuse of a bridge or of a moving vehicle. The materials entering into a structure may be unfairly treated. If the calculated strains are too high, or, what amounts to the same thing, too low, a factor of safety is employed, materials are unfairly used. Still further, where a structure is a composite it may, and undoubtedly does, often happen that the elements making up the composite are unfairly treated, as when, for economic reasons, not enough money is spent to properly install the structure. For example, a steel rail called upon to do its work supported by too few ties, insufficient ballast, and a badly drained sub-grade, is unfairly treated. Moreover, the state of repair in which structures are maintained is clearly an element in their fair treatment. If not enough money is spent in repairs, and parts become weakened by decay, corrosion, or wear to such an extent that failure results, it is entirely obvious that the failure must be attributed to unfair treatment.

But perhaps enough has been said in analysis of the causes of failure. Let us now devote a few moments to precautions which may be taken with material and workmanship in the interests of safety; and to a consideration of what should be our mental attitude toward design and unfair treatment. And first as to workmanship. Under present conditions the necessity for close supervision is evident. Managing men everywhere recognize this necessity and are employing all means at hand to secure it.

Second, with regard to material. It is difficult for us to see how anyone who is responsible for safety in structures dare at the present time put material into these structures which has not been bought on carefully prepared specifications, and which, before acceptance, has not been rigidly inspected and tested.

Third, bad workmanship and bad materials can apparently be so controlled as to secure safety by sufficient supervision and by having proper specifications, with rigid inspection and test. But how about the unfair treatment of materials, or the structures made from them?

Fourth, what shall we say of the engineer who makes the design? The truth is, he is often using materials in construction without sufficient knowledge. There is crying need for experiment. Testing machines, adequate to cope with some of the problems which now confront engineers, do not exist. We are increasing sizes and constantly building larger structures. If the test of service gives a failure, it simply proves that our guess as to the increase needed was wrong; and if the test of service shows freedom from failure we still do not know that we have used material wisely and economically. The factor of safety everywhere is largely a guess. The late A. L. Holly, one of the brightest mechanical engineers in this country twenty-five years ago, used to speak of "the ridiculous factor of safety, one-half of which is a factor of ignorance." We cannot help feeling that no better use could be made of some small fraction of the millions that have been accumulated by individuals in connection with our great industries during the past half-century than in the establishment of a Bureau of Engineering Research.

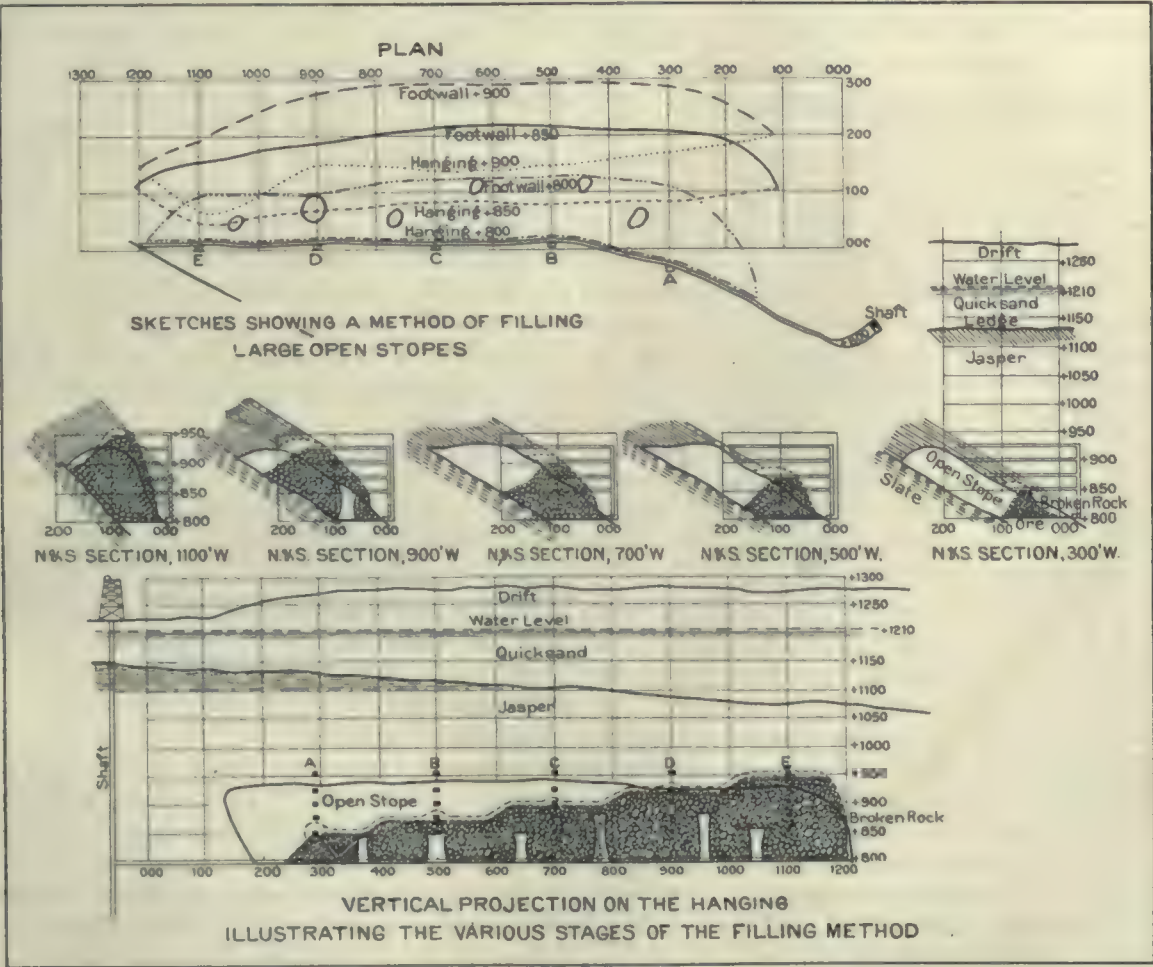
CHANGE OF METHOD IN MINING SOFT ORE.

Written for the MINING AND SCIENTIFIC PRESS
By STUART RHETT ELLIOTT.

The mine which is here described was originally laid out and worked on the square-set room-and-pillar system, the general plan being to make the rooms and pillars each three sets or 21 ft. wide. On the upper levels, however, the ore was mined in open stopes without timber. With the exception of a few small pillars which had been left to support the capping, these stopes formed a great open space, 750 ft. long, from 75 to 150 ft. wide, and from 75 to 250 ft. high, extending up the foot-wall at an angle of about 30 degrees. The mine had been worked on this plan for about fifteen years, when it passed to other interests. At

levels, by what is known as the caving system, no ore is left to support the capping, and the loss is small. The new management decided to adopt the caving system.

It was not thought advisable to open sub-levels directly below this large open stope without filling it. There was great danger that large pieces or slabs of rock falling from the hanging might suddenly crush the working places. Also it was feared that, if a sudden cave occurred over any part of the large open stope and ran a hole to the sand, the quicksand would flow rapidly to all the lower levels, blocking the means of escape for the men, and endangering their lives. Even assuming that such a cave could occur without loss of life, there would still be great chances of serious damage to the mine. The pumps would be



this time most of the available ore in the rooms had been removed, and it became necessary either to open additional levels and continue the original system of mining, or to attack the pillars. The latter alternative was decided on.

The general conditions were quite unusual. Above the rock-surface the sand varied in depth from 125 to 200 ft. The water-level was at 75 ft., making the thickness of quicksand from 50 to 125 ft. The original operators did not think it advisable or practicable to remove enough of the ore to allow the capping to break. It was thought that the quicksand would run into the mine, and that the volume of water which it would be necessary to pump would involve too great an addition to the cost. Under the original plan it was necessary to leave at least 50% of the ore in the mine. By mining the ore in sub-

cut out by the sand, which in all probability would completely fill the greater part of the rooms and drifts below 480 ft., and might even get into the hoisting shafts, in which case the expense of re-opening the mine would be heavy. If the sand got into the rooms, it would not be practicable to leave it there, as in future operations it would become mixed with the ore and greatly decrease its value. In starting the caving system it was therefore necessary in the first place to get a considerable thickness of filling into the large open stope. It was decided to obtain this by blasting rock from the hanging. It was thought that if the open stope could be nearly filled, all danger from quicksand would be avoided, because in case of a cave the broken rock would act as a filter, allowing the water to drain through but holding back the sand. Again, by filling

the open stope, the distance through which the capping could fall in case of a cave would be greatly decreased, and the cushion would deaden the shock, thus diminishing the danger of an air-blast, which might do serious damage to the drifts and even to the shafts. As soon as the pillars were completely surrounded by broken rock, extending up to the hanging, it would be possible to safely remove them by raising from a lower level.

The following is a brief description of the method used in filling the large open stope: from a drift which followed the hanging on the 480-ft. level, vertical raises were put up at intervals of about 200 ft. Each of these raises was stopped at approximately the extreme height of the open stope on the foot. They were made as small as practicable, as only a small amount of rock had to be handled through them. From the raise farthest away from the shaft, at a height of about 50 ft. above the main level, a small drift was driven toward the foot-wall. In order to avoid the possibility of suddenly holing into the open stope, the limits of which it was impossible accurately to survey, long holes were kept ahead of the breast. When within about ten feet of the stope, a number of holes were fanned out from the breast of the drift. By blasting these holes the drift broke through into the stope. The machine was then set up about ten or twelve feet from the end of the drift. From this one point numerous holes were drilled, up and down, and right and left, their general direction being toward the open stope, and their angle with a vertical plane passing through the centre of the machine and parallel with the general direction of the stope, being about 45 degrees. When these were blasted the hole made was conical in shape. This operation was then repeated, the length of the drift being decreased, and the work getting closer to the raise. The pile of broken rock gradually increased in height until it reached the elevation of the floor of the drift. The operation of drilling and blasting was continued until the rock ceased to roll down and began to pile up in the drift. The top of the pile of broken rock was then leveled, and the machine set up a few feet to the west of the line of the drift and close under the hanging. From this position long holes were drilled, inclined downward and in the general direction of the length of the stope. When these were blasted the pile naturally increased in length to the west. The operation was continued until the pile reached about 100 ft., or half the distance between the raises. Going east, working in the same way, this pile also finally attained a length of about 100 ft. The elevation of the first drift to connect with the stope was naturally determined by the distance between the raise and the stope on the main level, and the angle of the hanging side of the stope. The work of blasting off the bottom of the drift could not approach so close to the raise as to endanger it, as it had to be used as a traveling road for similar work at higher elevations. Next, a second drift was driven 25 ft. above the first, and in the same direction, until it also holed into the stope. The same operation, described for the first drift, was carried out in this also, and afterward in other drifts, at still higher elevations. As the rock

when broken occupied considerably more space than when solid, a point was reached when the broken rock ceased to run into the open space. But there remained a certain area next the foot-wall which could not be filled with safety to the men. When it became no longer possible to break rock by working from the first raise, exactly the same procedure was repeated in the next raise to the east, or 200 ft. closer to the shaft.

Great care had to be taken to protect the men. After each blast the rock was well trimmed and all loose pieces taken down. It was not necessary for the men to go far out into the stope where the back was a great distance above their heads. In fact, they were instructed always to keep so close to the hanging that they could touch it with their hands. By following this rule they would be in little danger from small pieces which might slab off. The men were also instructed to take no chances, and to leave their work and go to a place of safety when the rock was continually dropping from the hanging. It was not thought advisable to work a number of gangs on this filling at the same time. For safety it was thought best to start at the west end, and gradually work toward the east. In the breaking of the filling the hanging was still further undercut, and the chances of its caving were increased. The only real cause of anxiety was the chance of a cave occurring before the open stope could be sufficiently filled.

After working continually for two and a half years the stope was finally filled, and during this time no one was injured. Three months later a cave occurred, making a hole at the surface over 300 ft. diam. Anticipating the extra flow of water, the pumping capacity had been doubled, so that it was possible to handle about 2200 gal. per minute. The flow was so great for two days that it was necessary to replace the skips by bailers, which had been kept at the shaft in case of need. After the first few days the amount of water decreased rapidly. Not a pound of sand came into any of the drifts or working places of the mine. There was absolutely no damage done in any way.

As soon as there was a sufficient thickness of broken rock over any part of the open stope, sub-levels were started below. As the filling increased in length, it was possible also to increase the length of the sub-levels. The men mining the ore were safe, except from a sudden cave of great extent, which might close the working places. It is generally believed that extensive caves invariably give ample warning. The well known signs were closely looked for. There were several small caves which did not run holes to the surface. No chances were taken, and the men were not allowed to go into the mine until the stope again became quiet. As the ore on the sub-level directly below the broken rock was mined, the floor was well covered with lagging and the rock was drawn down. Before the cave occurred, the ore on the west end of the old stope had been mined for a depth of 50 ft. below the original floor. At the present time there is a large area over which the cap rock has been broken, and as the ore is removed the entire area slowly settles from the surface.

MEXICAN MINING LAW.

Translated by COURTENAY DE KALB.

On January 1, 1910, it is expected that a revised mining law will go into effect in Mexico. The bill has passed the Chamber of Deputies, and will be considered by the Senate at its session in September. The following is a translation of the first chapter.

CHAPTER I.**MINING PROPERTY AND ITS CHARACTER.**

Article 1. Property under direct dominion of the Nation, and subject to the dispositions of this Act comprises: (1) Formations of all inorganic substances which in veins, beds, or in masses of whatever form constitute deposits whose composition is distinct from that of the country rock, such as those of gold, platinum, silver, copper, iron, cobalt, nickel, manganese, lead, mercury, tin, chromium, antimony, zinc, and bismuth; those of sulphur, arsenic, and tellurium; those of rock-salt, and those of precious stones. (2) Placers of gold and platinum.

Art. 2. Exclusively private property pertaining to the owner of the soil comprises: (1) Formations or deposits of combustible material under all its forms and varieties. (2) Formations or deposits of bituminous materials. (3) Formations or deposits of salts which effloresce upon the surface. (4) Sources of water, superficial or subterranean, subject to disposition according to the common right and special laws regarding waters, without prejudice to the restrictions of Article 9. (5) Rocks of the earth and materials of the soil, such as slate, porphyry, basalt, limestone, and earths, sands, and clays. (6) Bog iron ore, and 'float' iron ore, and stream tin, and ochres.

Art. 3. The provisions of the Civil Code of the Federal District, relative to common property and its division, are applicable to mining property in all particulars not inhibited by this present act.

Art. 4. The unit of mining property is denominated a *pertenencia*, and it is a solid of indefinite depth, limited in the earth by the four vertical planes corresponding to the projection of a horizontal square of 100 metres on each side. The *pertenencia* is indivisible as regards all the acts and contracts that affect possession.

Art. 5. By 'mining estate' (or 'mining property', *fundo minera*) is understood the *pertenencia* or group of contiguous *pertenencias* conveyed by original title or by title transferred and derived from the original.

Art. 6. When on locating a mineral property (or estate, *fundo*) it may not be possible, on account of adjacent mines, to reduce it to integral *pertenencias*, the portion so irreducible will be denominated a *demasía*, considering it, for all legal purposes, to be composed of as many *pertenencias* as there are hectares (each hectare equals 2.47 acres) comprised in its horizontal projection, and the fraction of a hectare which may result will be considered as one additional *pertenencia*. When the irreducible portion may be less, in its horizontal projection, than one hectare, it shall also be called a *demasía*, and shall be considered, with regard to legal effects, as one *pertenencia*. The Regulation (that is, the explanation of mode of applying the law, to be issued later by the Department of Fomento) will determine the form and limits in which it shall be necessary to locate the *pertenencias* and *demasías*.

Art. 7. The owner of a mining property has the right to extract and avail himself of any or all of the substances enumerated in Article 1 which may be encountered on the surface or in the subsoil of the mineral property.

Art. 8. Mining operations may not be extended beyond the limits corresponding to each mining property (*fundo*) as set forth in the title, even when the boundaries consist of territory open to location.

The translation of the entire Project of Mining Law, in pamphlet form, can be obtained from the MINING & SCIENTIFIC PRESS. Its length prohibits publication in the paper. Price 50 cents.

Art. 9. To the owner of a mining property pertains the use and advantage of the waters which drain into the interior of the workings; in consequence he is empowered to extract and dispose of them, together with all the substances which they may contain in suspension or solution. He may not, however, claim any indemnity when said waters weaken or diminish by reason of the unwatering of other mining properties. When the appearance of waters in the interior of the workings may bring about the extinction or diminution of neighboring water-flows, the proprietors of those will possess the right to recover the waters which pertain to them, but without depriving the owner of the mineral property of the waters which he needs for the conduct of his industry, nor shall they be able to require any indemnification from said owner. The transference or loss of property right in a mining estate (*fundo*) involves respectively the use and advantage of the water which is encountered, or which issues in the interior of the workings.

Art. 10. The mining industry is a public utility; in consequence, the owners of mining properties have the right to expropriate under those circumstances and conditions which this law indicates.

Hydraulic Mine Equipment for Panama.

An agent of the Panama Canal Commission was recently in California studying hydraulic-mining methods with the intent to introduce economies in handling material on the Isthmus, if possible. The decision to adopt certain hydraulic methods has been reached, and the Commission is now asking for bids upon specifications which can be obtained from the Assistant Purchasing Agents of the Commission, who maintain offices in New York, Chicago, Boston, New Orleans, San Francisco, Los Angeles, and practically all of the larger cities in the country. The total amount of material to be handled is 8,000,000 cu. yd. We reproduce below an extract from the specifications:

"METHOD OF OPERATION.—Centrifugal dredging pumps will be sunk, by stages, in the prism to be excavated, until rock is reached, and the sedimentary material mined with monitors and sluiced to the dredging pumps. Salt water supplied through pumps will be used for mining and sluicing. As there are only 3000 electrical horse-power available, and it is not considered advisable to increase the electrical plant, the available power will be utilized for operating the dredging pumps only and the remainder supplied by an oil-burning steam-plant. The method proposed consists of a central pumping station to be operated by steam and provided with four or more high-duty pumps having a combined capacity of 30,000 gal. per min. through 3600 ft. of main. Each of the three lifting units will consist of a centrifugal dredging pump with belt-connected motor capable of handling 10,000 gal. of water per minute, together with the resulting debris. In short, the central pumping station must supply sufficient water for three units consisting essentially of the following, per unit: first, two monitors set on branch lines; second, one centrifugal dredging pump with belt-connected motor; third, all necessary pipe-lines, including connections and fittings.

"CAPACITY OF EACH UNIT.—Each of the units shall be capable of excavating and disposing of 300 cu. yd. of solid matter per hour, based on using 10,000 gal. of water per minute, or about 10 cu. ft. of water per cubic foot of material handled. Each dredging pump shall be capable of handling the above 10,000 gal. per min., together with the excavated material, as specified hereafter."

CENTRAL PUMPING STATION.—Bidders will submit a separate price for substituting reciprocating steam pumps, having the same combined capacity, for the centrifugal pumps and engines specified for the central pumping station.

It is the desire of the Commission to obtain, within reasonable expense, a pumping plant that is best adapted to the work to be performed, including economy in operation, and to this end any bidder who submits a proposition for the plant herein specified, together with alternative bid 'A', may also, in addition, tender proposals on specifications of the same which his experience may suggest.

Publications Received.

Any of the books noticed in these columns are for sale by or can be procured from, the MINING AND SCIENTIFIC PRESS.

HANDBOOK FOR FIELD GEOLOGISTS. By C. W. Hayes. Pocket size, flexible back, pp. 159. John Wiley & Sons, New York, 1909. Price \$1.50.

The first edition of this book was prepared as a guide to members of the U. S. Geological Survey, but proved to be in such demand that Mr. Hayes re-wrote the work and adapted it to general use. It is a valuable little hand-book and contains just those short practical points which every geologist must learn but no one thinks to tell him till after he has made a mistake. The information is not obtainable elsewhere in anything like the same detail.

STATISTICAL ABSTRACT OF THE UNITED STATES, 1908. Department of Commerce and Labor, Bureau of Statistics. 8vo., pp. 744. Washington, 1909.

This is the thirty-first number of one of the most valuable hand-books published by the Federal Government. The subjects treated include area, natural resources, population, agriculture, forestry, fisheries, manufacturing, mining, patents, labor, transportation, commerce, money, wealth, and many other topics.

WATER SUPPLY INVESTIGATIONS IN THE YUKON-TANANA REGION, ALASKA, IN 1907 AND 1908. By C. C. Covert and C. E. Ellsworth. U. S. Geol. Survey. Water Supply Paper 228, pp. 108. Washington, 1909.

The importance of quantitative data regarding water supply in the northern placer mining regions is recognized by the Government officials, and in this bulletin are maps and tables for the Fairbanks, Circle, and Rampart districts.

INVESTIGATIONS RELATING TO GOLD AND SILVER IN 1908. By J. M. Hill, F. L. Ransome, J. S. Diller, G. F. Kay, D. F. MacDonald, and J. T. Pardée. Pp. 80. Washington, 1909.

An advance chapter from the Contributions to Economic Geology of the U. S. Geological Survey for 1908, containing notes on Gunnison county, Colorado, the Hornsilver district of Nevada, and the Grants Pass, Bohemia, and Cracker Creek districts of Oregon.

SOME DESERT WATERING PLACES IN SOUTHEASTERN CALIFORNIA AND SOUTHWESTERN NEVADA. By Walter C. Mendenhall. U. S. Geol. Survey, Water Supply Paper 224, pp. 98. Washington, 1909.

The map, list of springs, and hints on desert travel make this report of high value to prospectors and others having occasion to travel in the region discussed.

THE FORTY-MILE QUADRANGLE, YUKON, TANANA REGION, ALASKA. By L. M. Prindle. U. S. Geol. Survey, Bull. 375, pp. 52. Washington, 1909.

The accurate topographic and geologic maps, and the brief texts forming this report, will be of high value to all undertaking development in the region.

PRODUCTION OF SLATE IN 1908. By A. T. Coons. U. S. Geol. Survey. Adv. Chapt. Min. Res., 1908, pp. 15. Washington, 1909.

Figures of production, with general notes on the classification and characteristics of slate, by T. Nelson Dale.

BRIQUETTING TESTS AT THE UNITED STATES FUEL-TESTING PLANT, NORFOLK, VIRGINIA, 1907-8. By Charles L. Wright. U. S. Geol. Survey, Bull. 385, pp. 41, Ill. Washington, 1909.

ILLINOIS SOCIETY OF ENGINEERS AND SURVEYORS. Twenty-fourth Ann. Rept. 8vo., pp. 287, Ill. Chicago, 1909.

Coal in Washington in 1908.

The total production of coal in Washington in 1908, as reported to E. W. Parker of the United States Geological Survey, was 3,016,557 short tons, having a spot value of \$6,673,091. Compared with the record output of 1907, the production in 1908 showed a decrease of 663,975 short tons,

or 18.04%. The value declined \$1,006,710, or 13.10%, and the output was the smallest in any one year, except one (1905), since 1903, due to the business depression. The price per ton in 1908 showed an increase over 1907.

The coal mines of Washington gave employment to an average of 5413 men in 1908, a decrease from 5945 men in 1907. The average working time decreased from 273 days in 1907 to 203 days in 1908, but where men work a fewer number of days during the year the intensity of labor may be increased. In the coal production of Washington this is shown by the fact that the average daily production per man increased from 2.27 tons in 1907 to 2.74 in 1908, but because of the fewer number of days worked the total production per man for the year shows a decline from 619 tons in 1907 to 557 in 1908.

Commercial Paragraphs.

The SULLIVAN MACHINERY Co. announces that its El Paso office and warerooms have been moved to 506-8 San Francisco street.

The BALDWIN LOCOMOTIVE WORKS, Philadelphia, has purchased the property, business, and good-will of the firm of Burnham, Williams & Co. and assumed all its assets and liabilities.

THE LUNKENHEIMER Co., Cincinnati, announces that it has recently sold an order for Renewo valves amounting to \$50,000, to the Panama Canal Commission. This is the second large order from the Commission during the past year.

THE CUTLER HAMMER MFG. Co., Milwaukee, Wisconsin, announces that it has purchased the plant, business, and patents of the J. L. Schureman Co., of Chicago, and that it will continue the business, for the present at least, at the old address, 70 West Jackson Boulevard.

The RISDON IRON WORKS, San Francisco, has lately closed a contract with the Nevada Mining, Reduction & Power Co., of Dayton, Nevada, for a 40-stamp mill. The building is to be structural steel covered with corrugated iron. Sixteen Risdon-Johnston concentrators are to be used in the mill.

The WESTINGHOUSE ELECTRIC & MFG. Co. has lately furnished electric equipment as follows for mining properties: six 600-hp. motors for the Washoe smelter of the Anaconda Copper Mining Co., at Anaconda, Montana; turbine plant for the Helena Power Transmission Co., Butte, Montana, supplying Butte mines with electrical energy under 70,000 volts pressure; and the pumping station of the Leonard mine of the Boston & Montana C. C. & S. M. Co., contains five 150-hp. Westinghouse motors direct connected to Nordberg pumps.

Catalogues Received.

CAMERON PUMPS are well illustrated in an excellent little paper, 'The Story of a New York House', which also tells how Adam Scott Cameron built up the business which still carries his name.

The DODGE MFG. Co., Mishawaka, Indiana, has lately published a handsome 104-page catalogue, called 'Twenty-Five Years of Rope Driving'. It is replete with numerous photographs and drawings and contains much that is of interest to all who are concerned with the transmission of power.

THE LUFKIN RULE Co., Saginaw, Michigan, has just issued its catalogue No. 8 in which are listed measuring tapes and rules of every description. A novel and decidedly useful improvement in the method of marking tapes, developed by this company, consists in repeating the number representing the feet at each inch or tenth-foot mark. Hence mistakes of integral feet in reading tapes are almost impossible.

The WESTERN GAS ENGINE Co., Los Angeles, is distributing a pamphlet containing information concerning a test made on a Nix-Frost suction oil gas producer and a Western gas engine. The test was made by William F. Durand, professor of mechanical engineering at Leland Stanford University. The result of this test shows, that with oil costing 75c. per barrel, the cost of fuel amounts to practically ¼c. per brake-house power hour.

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TABLE OF CONTENTS.

| | |
|---|-------|
| EDITORIAL: | Page. |
| Notes | 101 |
| Great Steel Works in Chile..... | 102 |
| Clemenceau and the New Industrialism..... | 103 |
| GENERAL MINING NEWS | 105 |
| SPECIAL CORRESPONDENCE | 110 |
| CONCENTRATES | 116 |
| DISCUSSION: | |
| What Is an Ore?.....C. S. Herzig | 117 |
| Santa Eulalia Camp.....F. J. H. Merrill | 119 |
| Civil Service Reform.....C. | 119 |
| ARTICLES: | |
| Mining in Northern Sinaloa, Mexico..E. A. H. Tays | 120 |
| Placers of Waldo, South Oregon....John M. Nicol | 122 |
| Mr. Murphy on Contingent Fees..... | |
|An Occasional Contributor | 124 |
| Placers of Tierra del Fuego.....S. H. Loram | 125 |
| Technical Knowledge of Mining..... | 128 |
| The Story of Bingham Canyon...H. W. MacFarren | 129 |
| Illinois Mineral Output, 1908..... | 132 |
| Coal in New Mexico in 1908..... | 132 |
| Oliver Continuous Slime Filters..... | 132 |
| DEPARTMENTS: | |
| Personal | 104 |
| Obituary | 104 |
| Market Reports | 104 |
| Publications Received | 131 |
| Commercial Paragraphs | 132 |
| Catalogues Received | 132 |

EDITORIAL.

ORE RESERVES blocked by the Ray Consolidated Copper Company are now said to be 28,000,000 tons, connections between drill-holes in one month having increased the proved cube 7,000,000 tons. The average copper-content of this ore is $2\frac{1}{2}$ per cent.

ADMINISTRATION of the National Forests involves the useful function of protecting timber from fire. The distribution of the forests in the West brings the fire-patrol within reach of a large part of the private-owned reserves as well. This insurance against devastation amounts to $1\frac{1}{2}$ cents per acre on the National Forests, and falls to nearly half that amount when the total area served is taken into account.

ANNOUNCEMENT is made by the Transvaal Chamber of Mines that the total gold production of the Rand to the end of 1908 has reached the splendid sum of \$1,120,000,000. That brings the Rand to third place in the list of the world's gold contributors, and it possesses a youthful vigor which will lead to ultimate dominance. At the present time the respective totals attained by the rival gold areas are, for California, \$1,511,500,000, and for Australia \$2,366,000,000. To approach these magnificent figures the Alaskans have still a long race to run, the gross output up to the end of 1908 being \$141,535,237. We have yet to hear from the quartz mines of the North, many of which are yielding such results as to promise a brilliant future.

MEXICANS are pleased with the transfer of Mr. Henry Lane Wilson from the court of Belgium to the ambassadorship before the Mexican Government. Mr. Wilson is a trained diplomat, an accomplished linguist, and is favorably known at Chapultepec through his former connection with the Mexican embassy. At the same time comes confirmation that Mr. Charles R. Crane has accepted the post of Minister to China. As a member of the great Chicago house of Crane Company he possesses the requisite commercial qualifications, in addition to his other accomplishments. He is intimately acquainted with the Orient, and speaks Russian fluently, which will aid in dealing with the delicate Manchurian problem.

CONSOLIDATION for the establishment of a trust is likely to entail internal difficulties. This has been discovered by the Western Federation of Miners. The rank and file find themselves in the same position with reference to the management as common stockholders to the board of directors and executive officers of a corporation. The officials at times forget the community of interest that should

make them unselfish administrators for the good of the members of the organization. Thousands of miners have failed to appreciate the need of persistent assessments after studying the financial statements issued by the officers of the Federation. They contrast the difference between their \$3 per diem with a cot in an ill-kept bunk-house, and the creature-comforts enjoyed by Mr. C. H. Moyer in Denver. They reflect upon the equality of condition which is the underlying principle of that socialism which the hard toiler understands, and they fail to see a practical application of it by their leaders. Hence the determined effort now being made by the convention of the Western Federation to oust Mr. Moyer and establish control by an executive committee.

HAWAII, it seems, is still represented in Mexico by a consul general, vice consul general, and various resident consuls. It is true that the 'consul general' has been dead some years, and that Hawaii has been annexed to the United States, but the Department of Foreign Relations not having been 'officially' informed of these facts, maintains the names on its published register. The annexation of Hawaii having been a side issue in connection with other war measures, it was evidently deemed an affair of either the Secretary of War or the Secretary of the Navy, and was overlooked by the State Department. The Government spasmodically awakens to the existence of the 'key of the Pacific' when the Japanese bogey recalls the defenselessness of the 'key'. But Señor Mariscal really ought to be officially informed that the administrative revolution led to the extinction of Hawaiian autonomy.

RAILWAY CONSTRUCTION in the West has gone steadily forward despite the hard times of the last two years. The Chicago, Milwaukee & St. Paul has been completed to Tacoma. The new Hill road from Spokane to Portland has been built, and within the year it is expected that the Western Pacific will be completed into San Francisco. These are all trunk-lines. Many important branches have been completed and others are building. Among these are the west coast line of the Southern Pacific in Mexico, the Northern Pacific from Portland to Tacoma, and the North Coast and Canadian Pacific in Washington. All open new territory and render old mining regions more accessible. They will doubtless greatly stimulate mining. The Western Pacific, with its low grades and substantial construction, should make extensive development possible in Sierra, Plumas, and other isolated mountain counties of California.

RUMORS of political ferment continue to come from Mexico. The adherents of Gen. Bernardo Reyes are active; naturally they desire the election of their candidate for the vice-presidency, and at times their enthusiasm becomes noisy. Such spectacles have been witnessed in the United States; and even England is not so staid but the authorities now and then are compelled to read the riot act. It is not warrantable to take these outbreaks of popular feeling as seriously as do some writers on public

affairs. President Diaz has created a new Mexico; he has given the nation rank among the great ones of the earth; and he has done it in the face of almost overwhelming opposition. Those who have fondly imagined that he was a popular idol, leading a grateful people by the power of love, simply have not known Mexico. It cannot be denied that the Reyistas have taken up a cry which is difficult to suppress. The desire of the Government to limit the freedom of foreign corporations was in answer to a growing demand of the younger generation. The liberal granting of concessions had alarmed them; the fear of great dominant foreign monopolies had taken root in their minds. The efforts of the administration to alter its policy have been met by determined resistance from foreigners, and from a large number of Mexicans whose interests are allied with the alien corporations. Hence it will be seen that opinion is divided, and that the two parties are merely in healthy opposition. There are checks and balances within the domestic political arena that insure stability.

CUBA evidently desires her resources to be better known. Mr. Leon J. Canova, an American, has been made director of a newly established Utility and Information Bureau in the Department of Agriculture, Commerce, and Labor at Havana. He should be addressed by intending investors. This is a step in the right direction. We hope, however, that adequate provision may be made for obtaining as well as giving information. Accurate surveys, topographical, geological, and agricultural, are much needed. General information is now-a-days of small import, and details of value can only be obtained by trained observers. Considering the time and money expended, the geological reconnaissance made by Messrs. C. W. Hayes, A. C. Spencer, and T. W. Vaughan was excellent, but for the solid development of the mineral resources much more extensive work is necessary.

Great Steel Works in Chile.

Chilean enterprise is emancipating that Republic from dependence upon foreign markets for supplies of iron and steel. Americans have been singularly dazzled by the vision of Cathay, a traditional light that has drawn attention away from larger opportunities in the Southern Continent. The foreign trade of South America is immensely greater than that of the Orient, but the United States has permitted other nations to absorb it. Nearly twenty years ago Señor José M. Balmaceda extended to capitalists in this country an opportunity to develop the iron deposits of Valdivia, under contract with the Chilean Government. This contract would have conceded subsidies assuring a substantial profit. Subsequent presidents have sought to enlist the interest of foreign capital, but all efforts in America and England proved futile. Finally the French lent a willing ear, the deposits were investigated, and as a result the stately structures of a great smelter have arisen on the shores of Corral bay, just south of the city of Valdivia. Six Kopper stoves have already been erected, the first blast-furnace is nearly

complete, and a second, with its accessory equipment, has been started. An aerial tramway has been provided to convey the ore to the smelter, a distance of eight kilometres, and charcoal ovens have been built, for it is proposed to utilize the splendid forests of Valdivia, in conjunction with the exceptionally pure ores available, for the manufacture of charcoal-iron. Announcement is now made that the erection of steel works will immediately follow. When it is realized that this undertaking is financed by no less a firm than Schneider & Company, owners of the famous Creusot works, next to Krupp the largest iron and steel manufacturers of Europe, the fact that a new industrial era is beginning in South America becomes apparent. The manufacture of machinery will speedily follow. The great water-powers of the rivers flowing down from the Andes to the Pacific will be developed, and the commercial requirements of the Andean chain of Republics will be locally supplied. The contract under which the Creusot concern has organized the *Compañía Siderúrgica Francesa*, approved by special act of the Chilean Congress, guarantees interest upon the invested capital in return for a stated annual production, secures the payment of a bounty upon the actual output, and grants a concession for the free use of enormous forests for a long period as a source of fuel-supply. The present demand for iron and steel in Chile exceeds 100,000 tons per annum, and that of its neighbor, Argentina, amounts to 700,000. Manifestly abundant warrant exists for establishing these works. The pity is that the people of the United States, trained by more than a century of successful pioneering, should not apply their talents to the development of the virgin resources of South America. The splendid achievements of our capitalists and engineers in Mexico should have encouraged a farther look into the possibilities of Spanish America. It was propinquity that led to our pleasant and mutually helpful relations with Mexico, and while propinquity is the determining cause of many marriages, some of the imagination that has run to waste in flirting with the Orient might have yielded better results if directed toward the South. It is not too late, however; immeasurable opportunity lies open to those who will seek it there.

Clemenceau and the New Industrialism.

France has lost a brilliant leader in the downfall of M. Clemenceau. In the shadow of the Moor the keenest master of men in Europe has met defeat. The unguarded reference to the political maelstrom into which France was nearly drawn through the bungling of M. Delcasse in the Algeciras crisis, was so unlike the inscrutable Clemenceau as to suggest that he must have been irritated by a rising of the Moroccan ghost in a new embodiment. Recent developments indicate that the new prime minister may take up the game at a moment of difficulty. He is likely to meet the German war lord flushed with confidence, with only a puppet-chancellor to convey his orders, and eager to catch at a fair excuse in Africa to divert attention from domestic finances. The retirement of both von Buelow and Clemenceau

while Morocco is convulsed with fresh dissensions, is a menace to the peace of Europe. Skilled men are needed in such affairs. The larger significance of the downfall of the great French statesman lies in the opportunity which it offers to the socialists. They welcome his defeat with joy. The sullen chanting of the 'Internationale' during the recent Government employees' strike had no terrors for Clemenceau. He met the organized workers with an irresistible weapon, the power of individual self interest. A combination among the strikers carefully made to-day was broken on the morrow through the halting of erstwhile leaders—and all France knew that the hand of Clemenceau had been outstretched. He was in some ways more subtle than Richelieu. The famous Cardinal worked through infinitely complicated subterranean channels, but he seldom appeared openly as an actor in the dramas which he controlled. M. Clemenceau, on the other hand, trusted largely to his knowledge of human nature to gain his ends. Characteristic was his treatment of the leader of the wine-growers' revolt nearly two years ago. A simple peasant, filled with indignation over the ruin of legitimate wine-making by the manufacturers of the artificial product, he discovered his power to influence men by a happy speech in the streets; he electrified the South of France by his simple oratory; the wheels of government became blocked; even prefects fell from power; and the struggle was brought to the very gates of Paris. The prime minister sent for the popular peasant leader, in whom the socialist party had come to place hopes of large success; he greeted him warmly, complimented him, praised him, assured him of sympathy for the working man, commiserated his poverty—"Poor fellow! You have not even means with which to take lodgings at an inn; here, take this hundred franc note to make yourself decently comfortable in Paris, and come to see me again day after tomorrow." He took it, and the next day the fact was flashed to every Canton in France; the leader of the peasants had disowned the badge of poverty; he was ready to take succor from the rich; his virtue had been drawn by a single hundred franc note. Thus the idol fell, and the peasants, deprived of their leader, followed the line of least resistance back into their routine of hardship. But France was saved from present trouble; mob rule was averted; the course of social evolution was not marred by revolution.

The downfall of M. Clemenceau is likely to exert a powerful influence on the labor movement throughout the world. France is on the verge of industrial transformation which will out-Belgian the Belgians. That great changes are inevitable may be conceded; but should they be precipitated suddenly, a devastating crash would assuredly follow. Precisely such a moderating genius as M. Clemenceau was needed to guide the State through these dangerous straits. That he should have been harassed into indiscretion is an impressive instance of fallibility in a great man; still more impressive is the fact that a ministry should fall because of a simple reference to a past event which all men knew but wished to forget. The pendulum that controls the affairs of nations swings from a tenuous thread.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

J. PARKE CHANNING is in London.

J. VOLNEY LEWIS is in Durango, Mexico.

E. C. HOLDEN is at White Plains, New York.

ALBERT ROBERTS is at Lake Tahoe, California.

H. E. WEST has left El Oro, Mexico, for London.

WILLIAM FORSTNER has returned to San Francisco.

ELWYN W. STEBBINS is at Nevada City, California.

C. S. HERZIG is expected in London, from Nicaragua.

F. L. BOSQUI is on his way from London to San Francisco.

W. B. WINSTON has returned from Oroville to San Francisco.

H. KILBURN SCOTT has returned to London from Nova Scotia.

FORBES RICKARD has been examining mines in Bingham canyon, Utah.

S. H. BROCKUNIER has returned to Wheeling, W. Va., from San Francisco.

CHARLES M. TAYLOR, of Greymouth, New Zealand, was in San Francisco.

L. R. GAY has been inspecting prospects in Sinaloa for W. A. PRICHARD.

R. GILMAN BROWN has returned in excellent health, from West Africa to London.

W. J. LORING, on his return from West Africa, is laid up, in London, with malaria.

HENRY S. WASHINGTON has returned from Bahia, Brazil, from a six months mine examination.

BENZO KATSURA, professor of metallurgy in the Tokio Imperial University, was in San Francisco.

JOSEF BAYER left by the S. S. *Ella* for Nicaragua, to resume his post at the La Leonesa mines.

E. R. PEMBROKE, former manager of the Boston & Pioche Mining Co., is in Montana examining mines.

JAMES H. MCCREERY, president of the San Felipe Mining Co., is now at the mines near Etzatlán, Jalisco.

W. WIDDOWSON has become superintendent for the Enterprise Mining Co., at Cooney, Socorro, New Mexico.

M. S. GRIFFITHS is engaged as general superintendent of O. y T. Braniff & Co., at Doctor, Querétaro, Mexico.

FRANK HAWKER of Mexico City has been in Tepic, Mexico. He will erect the new mill at the Tenamache mines.

W. H. COGHILL, professor of metallurgy in the Northwestern University, Evanston, Ill., was in San Francisco.

D'ARCY WEATHERBE, having recovered from a severe attack of pneumonia, returns to Rio Tinto at the end of July.

JOHN A. DRESSER and J. W. BELL, of McGill University, Montreal, inspected the Norton Copper Mine, at Suffield, on June 21.

HENRY F. A. RIEBLING has resigned as metallurgist for the Gold Run Mining & Tunnel Co., Wallstreet, Colo., and will reside in San Francisco.

J. M. NICOL has completed the designs for the water-power and pump-slucing plant for the Trinity River Mining Co., and is now in Mexico.

Obituary.

ISAAC RICHARDS, one of the best known Cornishmen of the older generation, died on July 3 at his home at Tavistock, Devonshire, at the advanced age of 87. For 46 years he was connected with the Great Devon Consols mine, in East Cornwall, from 1878 until his retirement in 1891 being general manager. This mine was once a large producer of copper and arsenic. Captain Richards designed the plant for the recovery of copper from the mine-waters, and also erected the arsenic refinery. His son, Thomas Richards, is well known as the manager at the Nundydroog mine, in India.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, July 22.

| | | | |
|--------------------------|--|--------------------------|--|
| Antimony | 12-12 ³ / ₄ c | Quicksilver (flask)..... | 44-44.50 |
| Electrolytic Copper..... | 15 ¹ / ₂ -16 ¹ / ₂ c | Spelter | 6 ¹ / ₂ -7 ¹ / ₂ c |
| Pig Lead..... | 4.60-5.55c | Tin | 32-33 ¹ / ₂ c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|--------------------|-------|----------|--------------------------------|
| July 16..... | 12.75 | 4.31 | 5.39 | 51 |
| " 17..... | 12.75 | 4.31 | 5.39 | 50 ¹ / ₂ |
| " 18..... | Sunday. No market. | | | |
| " 19..... | 12.75 | 4.31 | 5.39 | 50 ³ / ₄ |
| " 20..... | 12.75 | 4.31 | 5.39 | 51 |
| " 21..... | 12.81 | 4.31 | 5.39 | 51 |
| " 22..... | 12.88 | 4.31 | 5.39 | 50 ⁷ / ₈ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | July 15. | July 22. |
|------------------------|----------------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 8 6 | 1 7 9 |
| El Oro..... | 1 5 3 ex div. | 1 5 9 |
| Esperanza..... | 2 19 6 ex div. | 2 17 0 |
| Dolores..... | 1 10 0 | 1 10 11 |
| Oroville Dredging..... | 0 13 0 | 0 12 0 |
| Mexico Mines..... | 5 18 9 ex div. | 6 7 6 |
| Tomboy..... | 1 2 0 ex div. | 1 1 0 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

Closing Prices.

| | July 15. | July 22. |
|--------------------------------------|--------------------------------|--------------------------------|
| Amalgamated Copper..... | 80 ¹ / ₂ | 83 ³ / ₄ |
| American Smelting & Refining Co..... | 90 | 94 ¹ / ₂ |
| Boston Copper..... | 14 ¹ / ₂ | 14 ³ / ₄ |
| Butte Coalition..... | 23 ¹ / ₂ | 24 ⁷ / ₈ |
| Cumberland-Ely..... | 7 ¹ / ₂ | 7 ¹ / ₂ |
| Dolores..... | 6 ¹ / ₂ | — |
| El Rayo..... | 2 | 2 ¹ / ₂ |
| Giroux..... | 8 ³ / ₄ | 9 ¹ / ₂ |
| Greene-Cananea..... | 9 ¹ / ₂ | 9 ³ / ₄ |
| Indiana Sonora..... | 3 ¹ / ₂ | 3 ¹ / ₂ |
| La Rose..... | 8 ³ / ₄ | 8 ⁷ / ₈ |
| Miami Copper..... | 15 ¹ / ₂ | 15 ¹ / ₂ |
| Nevada Consolidated..... | 23 ¹ / ₂ | 23 ³ / ₄ |
| Newhouse..... | 1 ¹ / ₂ | 2 ¹ / ₂ |
| Nipissing..... | 11 | 10 ³ / ₈ |
| Ohio Copper..... | 4 ³ / ₄ | 4 ¹ / ₂ |
| Tennessee Copper..... | 37 ³ / ₄ | 37 |
| Utah Copper..... | 47 | 49 ¹ / ₂ |
| Yukon..... | 5 | 11 |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

Closing Prices.

| | July 22. | | July 22. |
|--------------------------|---------------------------------|---------------------------|--------------------------------|
| Adventure..... | 6 | North Butte..... | 55 |
| Allouez..... | 44 | Old Dominion..... | 56 |
| Calumet & Arizona..... | 104 ¹ / ₂ | Osceola..... | 134 |
| Calumet & Hecla..... | 650 | Santa Fe..... | 2 |
| Centennial..... | 33 | Shannon..... | 16 |
| Copper Range..... | 82 ¹ / ₂ | Superior & Pittsburg..... | 17 ³ / ₄ |
| Daly-West..... | 7 ³ / ₄ | Tamarack..... | 71 |
| Franklin..... | 16 ¹ / ₂ | Trinity..... | 11 ¹ / ₂ |
| Granby..... | 99 | United Copper Con..... | 9 ¹ / ₂ |
| Greene-Cananea, ctf..... | 9 ³ / ₄ | Utah Con..... | 43 |
| Isle Royale..... | 26 | Victoria..... | 4 ³ / ₄ |
| La Salle..... | 14 | Winona..... | 5 ¹ / ₂ |
| Mass..... | 8 ¹ / ₂ | Wolverine..... | 148 |
| Mohawk..... | 62 | | |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 22.

| | | | |
|---------------------------|-------|----------------------------|------|
| Atlanta..... | \$ 10 | Mayflower..... | \$ 8 |
| Belmont..... | 83 | Midway..... | 20 |
| Booth..... | 10 | Montana Tonopah..... | 63 |
| Columbia Mtn..... | 8 | Nevada Hills..... | 75 |
| Combination Fraction..... | 60 | Ophir (Comstock)..... | 1.17 |
| Dalay..... | 23 | Pittsburg Silver Peak..... | 47 |
| Fairview Eagle..... | 18 | Rawhide Coalition..... | 23 |
| Florence..... | 2.95 | Rawhide Queen..... | 35 |
| Goldfield Con..... | 6.30 | Round Mountain..... | 71 |
| Gold Kewenas..... | 9 | Sandstorm..... | 9 |
| Great Bend..... | 6 | Silver Pick..... | 10 |
| Jim Butler..... | 9 | St. Ives..... | 9 |
| Jumbo Extension..... | 16 | Tonopah Extension..... | 44 |
| Llanos Con..... | 75 | Tonopah of Nevada..... | 7.00 |
| MacNamara..... | 23 | West End..... | 22 |

General Mining News.

ARIZONA.

COCHISE COUNTY.

The Tombstone Consolidated Mining Co. cut a rich body of ore in the Tombstone mine. A station is being cut on the 1000-ft. level and new pumps have been ordered. William F. Staunton is manager.—It is reported that the Barrett mine, six miles northwest of Gleeson, is to be re-opened.—At the Heffern mine the shaft is being sunk below the 325-ft. level and a cross-cut run toward the contact from that point.—Samples from the ore recently cut by the adit on the Comanche Chief claim at Paradise assayed 17% copper, 24% lead, 3 oz. silver, and \$1 gold per ton. A winze is to be sunk on the ore and a cross-cut run between it and the old shaft.—J. W. Miller, of El Paso, has secured an option on the Scanland group in the Paradise district. The surface work on these claims has opened several copper-bearing veins.

GILA COUNTY.

The drift from the 600-ft. level of the Superior & Boston is in ore that assays 14% copper.—The shaft on the McEwen & Davidson claims, three miles northeast of Globe, cut a 6-ft. vein of copper glance at a depth of 40 ft.—The Sullivan shaft of the Cordova Mining Co. opened a body of 3% copper at 195 ft. This property joins the Miami, and it is thought to have a continuation of the Miami orebody that was cut at a similar depth.

MARICOPA COUNTY.

The St. Francis Gold Mines Co. is constructing a road from the Keystone camp to its mine. The company has sunk a 100-ft. shaft and driven about 800 ft. of cross-cuts on the property, opening a 2-ft. vein that assays \$15 per ton.

MOHAVE COUNTY.

The Desert Power & Water Co. has completed its power plant and is supplying Kingman, the Tom Reed, and Gold Roads mines with electric power. The Gold Roads mill of 40 stamps, with a tube-mill for re-grinding, and a cyanide annex, is nearly complete, and in a short time will be handling 200 tons of ore per day. The Tom Reed mill has installed 20 new stamps and will be running shortly.

SANTA CRUZ COUNTY.

It is understood that the Calumet & Arizona Mining Co. has secured an option on the Three R group in the Patagonia district. Considerable development work has been done on this property, which is owned by R. R. Richardson, and some ore shipped to the smelter.

YAVAPAI COUNTY.

The Shylock mine of the Central Arizona Copper Co. is to be re-opened. A 50-hp. hoist, pumps, and Temple drills have been purchased and will be installed at the mine shortly. On the 500-ft. level the work will be blocking out the ore, and at the 600 sinking will be resumed in the shaft. The old road from Grapevine is being re-built, and a contract has been let to the Arizona Power Co. to extend its lines to the company's camp. J. B. Cleaveland is superintendent.—The shaft of the Mt. Elliot Consolidated Mining Co.'s Dividend mine, near Chaparral, cut a vein that assays \$70 per ton at a depth of 500 feet.

CALIFORNIA.

ELDORADO COUNTY.

John McLean and George Baldwin have secured a lease on the Golden State mine and have commenced opening the old workings.—Williams & Costello have cut a 10-ft. vein on the Gold Crown property that mills about \$10 per ton.—Fred Kubie and Lin Arnold have bonded the Last Chance mine near Pilot hill and are installing a 2-stamp mill on the property.

MARIPOSA COUNTY.

Smith & Arnold, operating the Peach Tree and Panoche mines for the South Fork Mining & Power Co., have just completed a survey for a power-plant on the south fork of the Merced river.

NEVADA COUNTY.

The adit at the Gaston mine was driven 188 ft. during June. From the upper workings enough ore is being taken to keep the 10-stamp mill running. E. J. McCutcheon is manager.—Keller & McMillan, who have been opening the Yellow Metal mine near Bowman's dam, have interested H. H. Jack in the property, and the latter will finance the building of a 10-stamp mill.—A new compressor has been ordered for the Golden Gate mine and will be installed in a few days. The 10-stamp mill is running on good ore. W. P. Martin is superintendent.—The drift on the Blue Bell group of the Gold Bank Mining Co., near Maybert, is in 120 ft. on a 14-ft. vein. Surface samples from two ore-shoots on the property assayed between \$20 and \$40 per ton.

PLACER COUNTY.

The 1600-ft. adit at the Bishop mine has opened the Slab channel and a drift run along the bedrock. E. M. Threlkeld is president.—The Bisset brothers have taken \$1600 out of two pockets from their property on Iowa hill, near Colfax.—The Home Ticket mine has been closed by a strike, the men refusing to work underground with Chinamen. W. S. Fletcher is in charge of the mine.

SAN BERNARDINO COUNTY.

The Oro Belle shaft is in low-grade ore at a depth of 280 ft. A station will be cut at the 300-ft. level and drifts started from that point. The east and west cross-cuts on the 100-ft. level and the east cross-cut on the 200 have opened low-grade orebodies.—A new hoist is to be installed at the Dayton shaft of the Oro lease of the Big Chief Mining Co. at Hart, and sinking continued to the 500-ft. level. William L. Foster is manager.—The equipment for an additional 60 stamps has been purchased by the Gold Mountain Mining Co. in the San Bernardino mountains and will be placed in the mill in a short time.—At the Morse-Kizer mine at the mouth of Silver creek a 3-stamp mill is being constructed.—Dave Wright is erecting a 5-stamp mill on his property at the head of Silver creek.—The Acme Mining Co. is installing a 5-stamp mill at the mine 20 miles south of Hart.—At the Vontrigger mine of the California Gold & Copper Co., 18 miles south of Hart, the copper leaching plant is rapidly nearing completion. There are 30,000 tons of ore piled on the dump. A. H. Cram is manager.—The 10-stamp mill at the Vanderbilt mines is running steadily. Ohio capitalists have an option on the property.

SHASTA COUNTY.

Work is to be resumed on the Arps claims near Copper City.—Furnace No. 3 at the Mammoth smelter has been started for a short time while No. 5 is being repaired.—Monohan & Maxwell are shipping regularly from their lease in the Uncle Sam mine to the Mammoth smelter.

SIERRA COUNTY.

George Wingfield, the Nevada mine operator, has bonded the Pacific gravel mine near Port Wine. A bedrock adit will be started shortly to tap the channel, two miles of which is on the Pacific ground.—The drift on the vein of the Rainbow mine has opened another rich pocket of ore that is said to be higher grade than the first discovery.—Lutz, McMaha & Gambrina have obtained an option on the Rosasco property, three miles west of Downieville. The vein is on a serpentine contact and has been opened by a number of surface cuts showing it to have an average width of about 3 ft. The shaft and two adits on the property will be cleaned out and work resumed in each.—The old North Fork gravel mine north of Forest City has been bonded to George F. Stone and associates. The road to the mine is being re-graded and lumber and supplies hauled to the mine.—A cross-cut is being driven from the bottom of the shaft to the vein on the Bixby property. A surface adit opened a good shoot of ore carrying a large amount of arsenical pyrite. At the Omega the gravel averages about \$7.50 per car. Charles Brown is superintendent.—Fred W. Kuhfield is opening the Alpha claims, three miles north of Forest, and the Florence and Florence Extension, on Oregon creek, for a Los Angeles company. On the Alpha an adit is being driven that will give about 200 ft. of backs.

—H. Eckart has secured a bond on the New Jersey gravel mine, which contains a portion of the Omega channel.

TRINITY COUNTY.

The Morris brothers received \$400 per ton for a recent shipment of ore from their Spring Gulch property.—A 12-in. vein has been opened on the Gold Chest property of J. H. Boyce and associates.—The 400-ft. cross-cut has opened a 3-ft. vein on the Alaska mine. The property is owned by F. Junkans and P. Leulla.—The vein in the Mammoth mine of the Oversight Mining Co. has been cut on the lower level and a drift is being run to open the ore-shoot worked in the level above. A. H. Wolfe is in charge of the work.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Work is to be started next week in the construction of the new 50-ton mill for the Griffith Mining Co. The building will be situated near the portal of the Doric adit on Saxon mountain. The mill is to be equipped with a chemical-electro process, which is the invention of J. L. Malm, of Denver. A similar plant is to be built at the Stanley mine near Idaho Springs.—The holdings of the Democrat Mtn. M. T. & T. Co. were sold last week by the trustee in bankruptcy, F. Bromley, the property being purchased by H. O. Marcy, of Boston, the consideration being \$39,600, including costs. It is stated that during the next 30 days work will be resumed upon a large scale, as a company is now in process of organization.—The Geneva Ext. M. M. T. & T. Co., operating in the Peru district, has started a new cross-cut. It is intended to install a compressor and electric drills during the summer. E. K. Cass, of Georgetown, is manager.—G. J. Hite has started work upon the Bloating Bond group of claims, on Columbia mountain.—Work has been resumed upon the Stemwinder mine and a fair tonnage of sulphide ore broken from a streak of ore that is from 8 to 12 in. wide and assays from 275 to 324 oz. silver per ton. J. M. Shaller, of Denver, is manager.—E. F. Byers, leasing on the Pelican vein, shipped 100 tons of lead-zinc ore last week. The product was sent to the Mendota mill for concentration, and after reducing 5 to 1, the concentrate was sold for \$65 per ton. A vein of ore 3 ft. wide has been uncovered by Weaver & Co., leasing on the Lamartine. A shipment was made last week of 100 tons that was settled for on the basis of \$35 per ton. Occasional bunches of ore are found that mill as high as 19 oz. gold per ton.—The Katie Emmett mine on Cascade creek has been taken under lease by Ford & Co., of Idaho Springs, who have leased the Weeden 5-stamp mill. The entire dump is to receive treatment.

Georgetown, July 14.

GILPIN COUNTY.

The Incidental Gold Mining Co. has secured an option on the Incidental mine from the Pewabic Consolidated Mining Co. and the adjoining Hall property. The Hall shaft has been unwatered and a drift started from the 200-ft. level to connect with the Incidental workings. The smelting ore is being stored on the dump and the milling grade shipped to the Fifty mill at Blackhawk. W. L. Stull, of Russell Gulch, is manager.—During the past week a carload of concentrate was shipped to the Argo smelter from the Perigo mill.—An ore-shoot assaying \$14 per ton was opened on the Hilltop property in South Moon gulch. John Hilton owns the claims.—In the Sleepy Hollow mine 80 ft. of stoping ground has been opened on the 300-ft. level that averages 3 ft. in width. A streak of smelting ore varies from 6 to 20 in. wide and assays \$30 per ton, while the milling ore runs between \$8 and \$9 per ton. On the ninth level the smelting ore assays \$50 per ton, and on the eleventh level the ore recently opened averages the same. Floyd Weed is superintendent.

GUNNISON COUNTY.

A large body of iron ore is being opened near tank 7, on the west side of Marshal pass, to supply the Pueblo Steel Works with an ore for the manufacture of pig-iron.—The Vulcan Sulphur Co. has placed 35,000 shares of its stock on the market to raise money for further development. There are 10,000 tons of ore blocked out in the mine, and the re-

tort and refinery have been started for the season's run. Fred Russell is manager.—John F. Pearson shipped a \$1200 retort to the Denver Mint from the Gold Links mine at Ohio City.—Emil Peterson is opening some rich ore in the Victor mine at White Pine.—A new hoist is being installed at the Morning Star mine near White Pine. The mine is shipping lead-zinc concentrate to the Pueblo smelter regularly. J. C. Reagan is manager.

LAKE COUNTY.

The shaft on the Highland Mary property on Breece hill has cut 23 ft. of \$10 ore with some streaks of higher grade. The vein is almost flat, dipping about 15° to the southeast. Peter B. Horrigan is manager.—The ore recently cut by the shaft of the Iron-Silver Mining Co. at Leadville assays about \$40 per ton. The vein was cut at a depth of 1150 ft. on a lime-quartzite contact. William Carson is superintendent.—The Progressive mine has been equipped with new machinery and will be shipping ore in a short time. Al Ganz is manager.—The Valley mine on Little Ellen hill is shipping two cars of 40% lead ore per day.

LA PLATA COUNTY.

(Special Correspondence).—The May Day is shipping regularly.—The Lucky Four mine is being developed by a cross-cut near the level of the La Plata river, which is being driven with a Temple drill.—The Tomahawk Mining Co. is installing a 6-drill compressor and Heine water-tube boiler at its mines near the head of Basin gulch, and is contemplating the erection of a mill. T. J. Crowdis is superintendent.—R. H. Toll, backed by Denver capital, is re-opening the old Comstock mine. This mine was the first producer in the district, and in the middle '70s about \$75,000 was taken out of shallow surface workings, the ore being hauled by ox-teams to Pueblo, a distance of 300 miles.—The old Cumberland mine, near the head of the La Plata river, has been taken over by A. J. Clark and associates, of Telluride, and extensive improvements are being made. The 50-stamp mill is being remodeled and a large cyanide plant added. This property has been idle since before the cyanide process came into common use, and is said to have large bodies of \$28 ore blocked out which will yield 80% of its value to cyanide treatment.—It is reported that W. J. Adams, of Telluride, has leased the Columbus mine, a mile from the Cumberland. The property is said to have very good ore in the stopes.—At the head of Bedrock gulch two companies are resuming the development of the large low-grade copper deposits in the porphyry of that region.

La Plata, July 19.

OURAY COUNTY.

The machinery at the Calliope mine north of Ouray has been put in good running order and the buildings repaired. An ore-shoot from 15 to 18 in. wide has been cut by the 700-ft. adit, and a drift started. Tim Marlon is superintendent.—Fred Herzinger is shipping regularly from his lease on the Black Girl mine.—A cross-cut is being run from the Khedive level to tap the old workings of the Wedge mine. This will unwater a large portion of the mine so the pillars left from former operations can be drawn. F. M. Jackson and E. C. Weatherby have a lease on the property.—The Frank Hough mine on Engineer mountain is shipping 30% copper ore to the Durango smelter.

PARK COUNTY.

The Lincoln mine has started a force of teams hauling ore to Alta. There is considerable talk of building a smelter at that point to relieve the mine owners of the heavy freight to the smelter towns.

SUMMIT COUNTY.

Louis R. Johnson, who holds an option on the Iron Mask mine at Kokomo, is to install a compressor plant shortly. There is a good body of sulphide ore opened on the property.—An 8-ft. vein of carbonate ore has been opened on the Boston group at Mayflower by the Thompson brothers.

In the Atlantic mine on North Star mountain a 3-ft. vein of ore is being opened, samples from which assayed \$100 per ton.—The Lee-Gross mine is working on a vein that assays between \$16 and \$20 per ton.—The old Ling mine has been bonded and is being re-opened.—At the Arctic mine a 10-stamp mill has just been completed and is now

running on good ore. The company has also installed an electric drill in the mine. E. P. Jones, of Breckenridge, is manager.—At the O'Reilly group a cross-cut adit is being driven that will intersect the vein, giving several hundred feet of backs. The company expects to install an electric drill shortly. A. C. Howard is in charge of the property.—The tramway from the Silver Wave mine to the Montezuma mill will be completed before the end of the month. The mill is equipped to handle 250 tons of ore per day. E. B. Pfost is manager.—Frank P. Rosengarten has driven an adit 1000 ft. along the vein on his property on Collier mountain and opened a 300-ft. ore-shoot.—A vein has been cut at the Wellington mine on Mineral hill that assays 35% lead and \$20 gold per ton.

TELLER COUNTY.

Ganson, Halcrow & Taylor have secured a lease on block 25 of the El Paso Consolidated Gold Mining Co.'s property on Beacon hill.—A rich surface discovery has been made upon the Climax No. 1 claim on Squaw mountain, by lessees of the Little Puck Gold Mining Co., and the ore is being sacked for future shipment.—The Gold Dollar Consolidated Mining Co. paid a dividend of $\frac{1}{2}$ c. per share, a total of \$12,500.—A drift has been run 130 ft. on the vein recently opened on the 1300-ft. level of the Vindicator. On the 1400-ft. level a drift is being driven along the No. 2 north vein, which averages $2\frac{1}{2}$ ft. wide.—Hanson & Stewart, leasing from the El Paso Consolidated Gold Mining Co., have opened a 3-ft. vein on the 200-ft. level of the Little May mine that carries a high percentage of calaverite. The ore is being sacked for shipment.—Allen L. Burris has secured an option on the Doctor Jack Pot Mining Co., the Jack Pot Mining Co., and the Jennie Sample Consolidated Mining Co., representing a total acreage of 151.36 acres on Raven and Gold hills, for a New York syndicate.—A new vein has been cut in the Chicken Hawk mine on Guyot hill that contains both milling and smelting ore. Charles Walden is manager.

IDAHO.

BLAINE COUNTY.

Two veins have been opened on the surface of the Willow Creek property that mill about \$5 per ton. The 230-ft. adit is being driven to cut the main vein at a point that will give about 200 ft. backs. C. A. Stuart is president of the company.—P. A. Danahar has leased the Idaho-Democrat and installed a pumping and hoisting plant. The shaft will be sunk 400 ft. below the present workings and the vein explored from that point.

IDAHO COUNTY.

The sawmill machinery for the Elk City Dredging Co. is now being erected to supply the lumber to build the dredge on Elk creek. H. M. Williams is in charge of the work.—A contract has been let to drive the adit on the Gold Bullion property 120 ft. This should cut the ore-shoot opened by the old shaft. On the Columbia property of the same company a contract has been let to drive the adit 250 ft. G. M. Carter is in charge of the work.—On the Center Star property of Murphy, Brown & Tiedman, near Elk City, a 20-ft. vein has been opened that assays about \$25 per ton.

NEZ PERCE COUNTY.

Operations have been resumed at the Iron Spar mine near Lookout. A drift has been run 700 ft. along a vein that is over 40 ft. wide. John Curran is manager.

OWYHEE COUNTY.

The adit at the mill level of the Banner mine has cut several stringers of ore and it is expected to intersect the main vein shortly.—The Potosi mine at Silver City is to resume operations. J. E. Masters is superintendent.—The Bonnell mine in the Flint district is sacking rich silver ore for shipment.

SHOSHONE COUNTY.

The adit of the Tucker Mining Co. is in 400 ft. It is being driven to cut a vein of copper ore at a depth of 400 ft. that measures 50 ft. across the outcrop.—The drift on the property of the Silver State Mining Co. is opening a body of lead-silver ore. M. C. Lacey is superintendent.—The Pine brothers, of Wardner, have opened a 6-in. vein of

galena on their Pine creek claims.—Work on the Rhode Island has been suspended on account of poor ventilation. A blower will be placed at the mouth of the shaft and the work of cross-cutting from the 100-ft. level to the vein continued. Assays from the outcrop run \$8 gold and 7% copper. F. J. Martin is manager.—The Midway-Summit Mining Co. has purchased a compressor and rock-drills and is installing them on its property between Burke and Mullan. A good showing of galena has been made in the upper workings and the company is running a lower cross-cut to tap the orebody. George Herron is superintendent.—The Imperial Mining Co. near Burke is building an auxiliary electric-power plant that will connect with the Washington Water Power Co.'s line. The company is opening a vein of lead-silver ore.—The Orofino Mining Co. has placed a block of stock on the market to raise money for the construction of a mill at the Orofino mine east of Murray. The plant will have a capacity of 100 tons per day and will be completed this year. The company is shipping its high-grade ore and blocking out the lower-grade for the mill. P. Burke is manager.

MICHIGAN.

The excavation work has been completed for the new stamp-mill for the King Phillip and Winona companies and the foundations are being laid. The material for the superstructure is on the way.—The Adventure Consolidated Mining Co. is down 40 ft. with its vertical shaft, with which it will develop its three newly discovered veins. The first of the three veins will be reached at a depth somewhat greater than 900 feet.

MONTANA.

MISSOULA COUNTY.

Plans are under way for the erection of a concentrating plant at the property of the Tarbox Mining Co., near Saltese. The company has opened a large body of low-grade lead-silver ore. Richard Dixon is superintendent.—Kansas City capitalists have bonded the La Casse brothers' placer claims on Cedar creek for \$250,000 and are installing a dredge on the property. The gravel runs 5c. per cubic yard, and the claim covers a distance of three miles along the canyon, including several water-rights.—A new hoist has been installed at the Iron Mountain mine and operations resumed. A station has been cut on the 1700-ft. level and shipping will be resumed shortly.

NEVADA.

CHURCHILL COUNTY.

The clean-up at the Fairview mill for two weeks run amounted to \$4000. The mine has a large quantity of milling ore blocked out that will keep the mill busy for several years. Tom Gordon is superintendent.

ESMERALDA COUNTY.

(Special Correspondence).—A 2-ft. vein of gold-silver ore has been intersected 20 ft. below the 185-ft. level at the Grutt Balloon Hill.—The Lillian lease has cut a rich shoot of ore on the 100-ft. level.—The Queen Mining Co. has discontinued mining on company account, and the work will be carried on by lessees, who pay a royalty of 30%.—The Victor lease on Yankee Girl has opened a 4-ft. vein of ore assaying \$85 per ton. Frank McKelvy is superintendent.—The Miller lease on Coalition is sinking and cross-cutting from the 200-ft. level.—A station is being cut at the 400-ft. level of the Mint shaft, where a vein of high-grade sulphide ore has been opened.—The reduction plant of the National Ore Purchasing Co. is rapidly nearing completion, and the management expects to be in a position to receive ore about the end of July.

Rawhide, July 16.

LINCOLN COUNTY.

Plans are under way for the construction of a smelter for the Nevada-Utah Mines & Smelters corporation of Pioche. The plant will have an initial capacity of 500 tons per day and will treat custom ore. The company has curtailed the output of the Day mine to 50 tons per day. James P. Gas-kill is manager.—The Boston & Pioche Mining Co. shipped two cars of high-grade ore to the Salt Lake smelter.—The Oregon-Pioche has installed a gasoline hoist and will sink

to the 200-ft. level.—The east drift on the 300-ft. level of the Golden Prince cut a 20-ft. orebody that averages about \$15 per ton. Dean R. Low is in charge of the work.

NYE COUNTY.

(Special Correspondence).—The Montana-Tonopah has increased its extraction from 89½ to 92½%. The company is shipping between 100 and 150 tons of concentrate per month.—It is reported from Philadelphia that James S. Austin, president of the Tonopah Mining Co., is in favor of sinking the main shaft of the Tonopah to the 2500-ft. level, if necessary, to avoid the rock intrusion. It is likely that the extra dividend of the company will be abolished at the next meeting of the directors. The last 800 ft. of the 1500-ft. shaft is in a barren zone, and the management desires to pierce this intrusion as soon as possible.—The Belmont shaft continues in good ore.—The first shipment of ore, approximating 80 tons, from the Ellendale has been made to the sampler at Millers. The ore came from the North Star claim.—Lease No. 1 on Sunnyside Extension at Round Mountain is taking out rich ore. The incline shaft is down 80 ft.—The capacity of the Johnnie mill has been increased by the installation of Pierce amalgamators. During June the stamps treated 55 tons per 24 hours for 26 days. It is expected that the monthly clean-up will be considerably above that of former periods.—The Moore-Chindgren lease at Central, near Manhattan, has opened a deposit of some of the richest gravel yet found.—The Victor has cut a 6-in. streak of silver ore running \$200 per ton.—The main shaft at the Mogul is down 584 ft., with a 7-ft. vein opened at the 400-ft. level. On the 100-ft. level the north cross-cut has been extended 600 ft. The main vein is 6 ft. wide and assays from \$10 to \$15 per ton. The company is contemplating the erection of a 50-stamp mill in the near future. J. V. Priest is manager.—The orebody at the Golden Anchor has been opened for 300 ft. and is from 18 to 30 in. wide.

Tonopah, July 17.

The Solid Gold mill at Round Mountain has been started on company ore. The pipe-line from the Shoshone mine has been completed and the mill is assured of a plentiful supply of water. C. Johnson is manager.

STOREY COUNTY.

A vein of high-grade galena ore has been cut on the property of the Cooney brothers in the Badger district, 14 miles northeast of Virginia City. The vein is 1½ ft. wide and assays about 500 oz. silver per ton and 20% lead.

WHITE PINE COUNTY.

The shaft of the Boston-Ely is to be stopped at the 850-ft. level and a heavier hoist installed. On the Matilda claim a streak of ore assaying 15% copper and \$70 gold is being followed. Ed. W. Ralph is superintendent.—The strike situation at Ely remains unchanged. The shooting of two Austrian miners by deputies has caused an extremely bitter feeling toward the mine owners. Thomas Corra, the Denver representative of the Western Federation, is at the scene of the strike and every endeavor is being made to prevent further bloodshed. The strike is due to a cut of 50c. per day in the miners' wages.

OREGON.

BAKER COUNTY.

Several tons of high-grade ore were shipped from the vein recently cut in the Buffalo Monitor mine for a trial run. Drifts have been run on the vein in both directions and some good ore opened. C. L. Cox is manager.

GRANT COUNTY.

Walter G. Gleason has purchased the Independence group of quartz claims near Granite for \$6000.—The Amazon Mining Co. has acquired four additional claims in the Greenhorn district.

JOSEPHINE COUNTY.

At the Waldo copper mine 3000 tons of ore are stored on the dump. In the mine the work is confined to blocking out the ore in anticipation of the starting of the Takilma smelter which, with the Queen of Bronze mine, is at present closed by litigation.

NEW MEXICO.

OTERO COUNTY.

Lack of material has held back the work on the smelting plant of the Orogrande smelting plant at Orogrande, but it is expected that the furnace will be blown in the latter part of this month and the mines started.—L. D. Baker, of Oklahoma, has purchased the Mamie group of claims in the Orogrande camp from Joseph P. Mocker for \$25,000.—A good tonnage of ore is piled on the dump of the Delusion mine, and three cars of ore were recently shipped to the El Paso smelter. Charles H. Knibbs is in charge of the work.—Culver & Downs have sunk a 200-ft. shaft on the Gem group that cut a 15-ft. vein of sulphide.—The raise from the 200-ft. to the 90-ft. level on the Monarch property opened a good shoot of ore. George E. Moffett is in charge of the work.

TEXAS.

LLANO COUNTY.

(Special Correspondence).—The work of proving the extent of the iron-ore fields in the vicinity of Llano has been going on for several months under the direction of William B. Phillips, who represents Robert Downman, of New Orleans, and associates, who own the Iron Mountain mine and other deposits of iron ore in that section. The Texas railroad of J. J. Hill and associates is being extended toward Llano, and preparations are being made to extend the Fort Worth & Rio Grande division of the Frisco system south from Brady. These roads will place the Llano iron-ore field in direct touch with the coalfields of Thurber, 100 miles distant.

Llano, July 20.

TRAVIS COUNTY.

(Special Correspondence).—It is the present intention of Governor Campbell to convene the Legislature in special session in November or December of this year. If he does so, he will be urged to submit a recommendation to that body for the enactment of an adequate mining law. The Legislature at its session a few months ago passed a new mining law which embodied in its provisions features that met with the approval of men interested in the mining industry who desired to see the mineral resources of the State developed. This bill was vetoed by the Governor because of an alleged unconstitutional provision relating to the submerged lands along the Texas coast. The vitiating provision had no place in the bill, as it was foreign to the subject for which the Act was intended to relate. It was near the closing session when the bill was vetoed and opportunity was not afforded for the re-introduction of the measure. The State owns a vast acreage of land in the mineral region of Texas, and with the encouragement and protection of an adequate mining law prospectors would be quick to avail themselves of the opportunity of exploiting these lands. The existing mining law of Texas is really a prohibitive measure, so far as inducing mineral development upon State lands is concerned. It imposes a heavy burden upon the prospector from the very beginning of the location of the claim, and should paying mineral be found, the State Land Commissioner is authorized to fix any price for the property that he may see fit. No prospecting has been done upon State lands since the law was passed.

Austin, July 19.

UTAH.

BEAVER COUNTY.

The Cactus mine at Newhouse has resumed operations and the mill started. The company hopes to produce copper at less than 9c. per pound. Samuel Newhouse is manager.—The shaft of the Cupric Mines Co. cut some excellent copper ore at the 325-ft. level. The ore occurs in large kidneys, and several shipments have been made to the Tintic smelter. M. C. Morris is manager.

JUAB COUNTY.

The Montana Mining Co. has made its first payment of \$10,000 on the Mellich group of claims in East Tintic.—On account of a break in the machinery the Opex mine at Mammoth has been shut down a week. A slight flow of water was struck on the 2180-ft. level. A new station pump

will be installed at that level and sinking continued. Frank P. Swindler is manager.

SALT LAKE COUNTY.

The Tintic Mining & Development Co. has accepted several contracts to smelt custom ore at its Yampa smelter.—A new compressor and hoist has been installed at the property of the North Utah Mining Co. in Markham canyon, and other equipment is to be added shortly. W. D. Bohn is manager.—At a stockholders meeting the directors of the Emma Copper Co. proposed the issuing of 150,000 shares of stock to raise money to cover the present indebtedness and carry on development work.—A new company, known as the Yosemite Mining Co., has been organized to work the Yosemite and Cluster mines, near Bingham Canyon. It is understood that the Bingham Mines Co. is interested in the new organization.

SUMMIT COUNTY.

The Western Monitor Mining Co., operating in the head of Iron canyon, is sinking a double-compartment shaft and running several drifts in a body of iron ore.—The New York Bonanza is to be unwatered and sinking resumed at the 800-ft. level. A station will be cut at the 1000-ft. point and cross-cuts run from there to explore the orebody that has been opened in the upper levels. M. J. McGill is manager.

UTAH COUNTY.

The adit on the Mineral Flat property at American Fork cut 3 in. of ore. The contact was cut 200 ft. above, showing 4 ft. of vein matter, and an adit has been started 500 ft. below. The Mineral Flat mine is one of the Knight properties.

WASHINGTON.

FERRY COUNTY.

Two drills have been installed on the property of the South Republic Mining Co. at Republic and two more will be added to the equipment in a short time. Drifts on the 250-ft. level have opened some good ore. M. Hollis, of Spokane, is manager.—A dividend of 1c. per share will be declared August 1 by the New Republic Mining Company.

OKANOGAN COUNTY.

Extensive plans have been completed for the financing and development of the Q. S. Mining Co.'s property. The outline includes the building of 75 miles of electric road from Nighthawk to Brewster and a smelter near the mine. Adelbert M. Dewey, of Spokane, is manager.

STEVENS COUNTY.

The Ark Group Mining Co. has opened a good body of silver ore three miles south of Kettle Falls. J. J. Burke is manager.—The Crystal mine near the mouth of the Spokane river has been sold by John Gray, representing the Crystal Mining Co., to French capitalists.

CANADA.

BRITISH COLUMBIA.

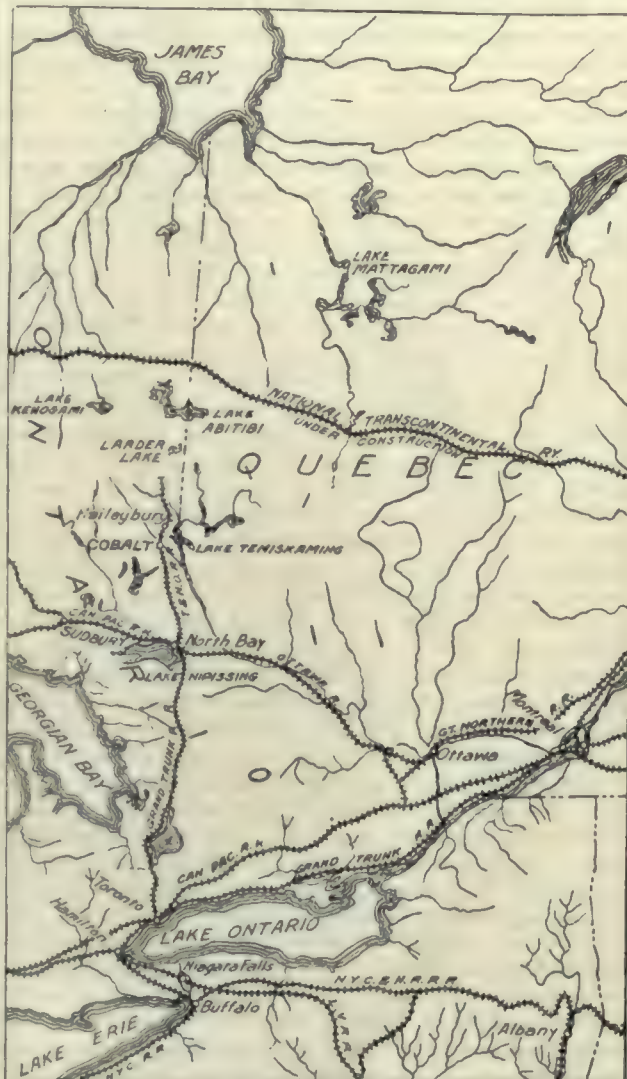
At Miskatiah bay, 20 miles from Kitimaat, a rich outcrop of copper ore has been opened about 500 ft. above the sea-level. The ore is copper glance assaying about 60% copper and 48 oz. silver per ton. The ore was discovered by James McLennan.—The main drift of the Fife Mines, Ltd., property at Fife has been driven 400 ft. along the vein and a raise made to the surface. Much of this work has been through ore that runs from 3 to 6% copper and from \$4 to \$8 gold. A winze has been started in ore and the output of this is being shipped to the Trail smelter.—A dividend of 2s. per share has been declared by the Le Roi No. 2 company.

ONTARIO.

The Townsite Mining Co. has disposed of a large block to English operators and has resumed operations.—A new vein of cobalt ore carrying a high percentage of silver has been opened on the Nova Scotia property.—At the Strathcona four diamond-drill holes are being run to cross-cut the vein system of the property. The first hole is down 350 ft. and has cut several small veins that show traces of cobalt and silver. A compressor, two boilers, and a rock-drill have been added to the equipment of the property.

QUEBEC.

The Golconda Gold Mining Co. has nearly completed the buildings at its property near Sherbrooke and will install the machinery in a short time.—William Marshall is financing the Compton Gold Dredging Co., which is the first operator to work dredging ground in the Province.—The Black Lake Consolidated Asbestos Co. has been organized at Montreal to consolidate the Union Asbestos,



Map Showing Portion of Quebec.

Southwick, Black Lake Chrome & Asbestos, and Imperial Asbestos companies.

MEXICO.

CHIHUAHUA.

A force of men has been put to work in the Prieta mine near Parral blocking out the ore in anticipation of the 30-stamp mill that is to be erected on the property. D. H. Bradley, Jr., is in charge of the work.—A new set of boilers has been installed at the power plant of the El Rayo Mining Co. George H. Schroter is manager.—The silver mines of the Candalaria Mining Co. at San Pedro have been unwatered and are shipping regularly to the El Paso smelter. The July output will approximate 200 carloads.

GUADALAJARA.

As the result of a favorable report upon the Cinco mine in the Hostotipaquillo district by John B. Farish, the company will erect a 5-stamp experimental mill, and later a 250-ton reduction plant, when the correct treatment for the ore has been outlined. The mine was purchased last year by the Marcus Daly estate for \$530,000.—The Makeever adit at the El Favor mine cut a 55-ft. vein at a depth of 750 ft., the greater part of which is ore of milling grade. The work on the reduction plant is proceeding rapidly. A. A. Watson is in charge of the work.

Special Correspondence.

NEW YORK.

Goldfield Consolidated Quotations.—Other Nevada Stocks.—Curb Regulations.—San Toy.—Planet Copper Mine Sold.—Big Vein Copper.—Alvarado Consolidated, Mexico.

For several weeks Goldfield Consolidated stock has been erratic on the New York Curb, and it still has a declining tendency. The decline in this stock, together with ugly rumors in circulation to explain it, coming after the recent slump in Goldfield Daisy, has had a bad effect on mining investments generally. The investing public has lost heavily in both these mines and in the Rawhide Coalition, and Nevada mining investments will for some time feel the bad effects. Many investors appear puzzled as to the cause of the slump in Goldfield Consolidated stock. The explanation, however, seems simple. It is the result of loss of confidence in the management of the company following the exposure of its market rigging and the recent stock deals with Hayden, Stone & Co., Scheftels & Co., Barney & Co., Baruch & Co., and other Jewish houses. The mine is controlled by George Wingfield, erstwhile Tonopah saloon-keeper, and a mining promoter. Two years ago he added several fresh mining leases to the company's holdings and the company was re-organized with a capital of \$50,000,000. This capital was criticised at the time of the re-organization as excessive; but by ingenious manipulation, and by saving the rich ore in the mine for the first crushing at the new mill to make a fine showing, the stock was run up to \$7.50 per share. The public took a large amount of it at about that price. Large blocks of the stock were also placed in Europe by the Jewish houses who loaned Wingfield the money to buy the Combination mine, receiving large stock-bonuses. Even at the present price the stock is considered unsafe, and the public shrinks from putting further money into any of the disgraced corporations, the Goldfield Consolidated, the Daisy, and the Rawhide Coalition. It is regretted by local mining men that the rank manipulation in the above companies' stocks was permitted to continue so long without exposure.

The agent of the New York Curb market, as the result of the numerous exposures of scandals relative to mining corporations, has issued to the secretaries of all mining corporations whose stock is traded in a form of statement to be filled monthly. The Curb committee desires to know something about the corporations whose stock they handle daily, and they want to be in a position to answer some of the inquiries frequently put by the investing public. The agent requires mining companies desiring Curb privileges to regularly forward to the agent monthly statements. On the asset side such statements must show the amount of cash it has on hand and in bank, accounts receivable, ore and bullion with smelters and bullion dealers, concentrate ready for shipment, bullion in vault ready for shipment, ore on dump and ore broken in mine, stores and supplies, plant tools and equipment, and mining rights. On the liability side must be disclosed: unpaid interest, unpaid dividends, notes and accounts payable, trade creditors and miscellaneous, officers of the company, employees for wages; reserve for transportation and treatment; surplus, capital and surplus, capital, common, par value preferred in treasury dividends, rate, when and where payable; date of last dividend paid; bonds (state first mortgage or otherwise), bonds outstanding, bonds in treasury, denomination (if coupon registered), when dated, when due, interest, when and where payable. This is a commendable move and may result in good. It is doubtful, however, whether many of the companies traded on the Curb will dare to furnish the required information. If the public were in possession of it, stock prices would rapidly change and manipulation would be ineffective.

The directors of the Alvarado Consolidated Mines, Mexico, report that the public has subscribed to the treasury stock recently offered with the view to erecting a cyanide plant. The treasury now holds \$1,000,000 cash, which will be im-

mediately expended in a cyanide plant, and in other necessary machinery. Boston interests are active in advancing the price of San Toy stock in New York, Boston, and Pittsburgh. The San Toy is one of Thomas Lawson's Mexican promotions, and is capitalized at \$6,000,000. The par value of the stock is \$1. Lawson is also handling the Chino company's stock. This is another Mexican company he lately promoted.

The General Development Co., of New York, a Lewisohn concern, has purchased the Planet Copper Mining Co.'s property, Yuma county, Arizona, on the recommendation of W. H. Weed, its copper expert. The Planet company is a New York concern, which was organized under the laws of Arizona in 1902. The Planet mine is an old one and has produced some rich ore. The company's holdings comprise 25 claims, having an area of 500 acres. Three incline shafts have been sunk on the vein. The deepest incline is down 800 ft. The vein is of large size and is capped with iron. The shipping ore averages about 8% copper. A large price was given for the mine. The Big Vein Copper Co., of Tucson, Arizona, is the latest copper company to have its stock listed on the New York Curb. This company was recently organized under the Arizona laws with a capital of \$10,000,000. The company expects to develop a copper prospect. Lee Shubert, the theatrical man, is one of the directors. The New York stock market has been dull and heavy lately. Steel common has been highly manipulated, and it is generally believed that it will be run up to 75 as soon as J. Pierpont Morgan returns to New York. Mr. Morgan is returning to take part in the flotation of the Panama loan. While he is in the City the stock prices will not be allowed to decline materially.

LONDON.

East Pool and Carnbrea, Cornwall.—Wanderer Mine, Rhodesia.—British Eight-Hour Law.

It is regrettable to record the falling off in tin-content at the East Pool mine in Cornwall, and the consequent financial embarrassment of the company operating it. For a great many years the mine yielded large profits, and it successfully weathered the periods of depression in the tin market. Four years ago the directors commenced to re-organize the dressing plant. Before dismantling the old Cornish stamps, two heads of air-cushion high-speed stamps were erected on trial. In addition Frue vanners and Wilfleys were provided, and a Wetherill magnetic separator was erected for the purpose of separating the tin from the wolfram. The ore is highly complex, and contains, besides tin, a fair amount of wolfram, arsenical and copper pyrite. Successful metallurgical treatment requires constant experiment, and a considerable number of processes are involved. A year ago it was decided to provide four more heads of air-cushion stamps, and to do away with the old Cornish stamps entirely. Thus the whole plant is renovated, and is now ready for operations. For more than six months it has been known that the lodes have become poorer, and at present heavy losses have been made in the working, and shareholders are having to pay up. It should be mentioned that East Pool is one of the few remaining mines using the cost-book system, but unlike most others it has not been in the habit of dividing profits up to the hilt, as may be seen from the fact that the new plant has been provided entirely out of income. It is probable that the company will now have to adopt limited liability, for it is evident that larger sums will be required for underground development than the present shareholders will care to put up. Scientific exploration on a systematic scale will be requisite, if the ore supplies are to be maintained. The mine recently lost its manager by the resignation of Captain Tamblin, and Captain Jennings has succeeded him. Captain Tamblin was one of the old school who believed in the ancient dictum, "where it is, there it is." It is no disparagement to him to say that East Pool, under the direction of a more scientific student of ore deposits, may again become profitable.

In writing of the Carnbrea mine, adjoining East Pool, some months ago, I mentioned that at this mine much of

the tailing was stacked instead of being discharged into the Red river, as is the usual custom in the Camborne district. Also there are large dumps of low-grade ore which have never been treated. There is now some prospect of these dumps and residues being worked. In some cases they have paid and in others losses have been incurred. The project at Carnbrea has been put before the directors by outsiders who will take the risk themselves and pay the company a royalty on the ore treated. As the surface at the disposal of the company is limited, the dumps will be transferred for treatment at the old Wheal Agar property, where ball-mills and concentrators will be erected. It is estimated that the dumps average 8 to 9 lb. of black tin per ton.

It would be difficult to find a lower grade mine worked at a miner's profit than the Wanderer, in Selukwe, Rhodesia. The extraction at this mine is only a fraction above 2 dwt. per ton, and yet the mining expenses are met. During the twelve months ended April 30 last, the mill treated 186,708 tons of ore, and recovered 18,906 fine ounces, which is an average of 2.024 dwt. per ton. The amount realized by the sale of the gold was £80,392, and the mining costs were £64,535. A profit of £15,857 is thus shown, but after other expenses in Rhodesia and London have been paid there is not much left. In fact the necessary allowances for depreciation have put the balance on the other side. For instance, consulting engineers' fees run to £2700, directors' fees £800, and so on. The amount written off for depreciation is £17,149, which seems large, but it must be remembered that the property-account in the balance-sheet stands at a high figure. The ore at this mine is a gold-bearing sandstone, and the extraction is effected by dry crushing and cyaniding. The gold-bearing bands are narrow, and mining there involves the removal of barren overburden. The ore reserves at present consist of practically two years' supply. The company is about to take over the Camperdown mine, belonging to the Matabele Proprietary Mines Co., which it has been working on lease for some time. The ore here is of higher grade, averaging 4.65 dwt., and the supply already exposed amounts to 325,000 tons. The directors of the company have taken the opportunity presented by the purchase of this second mine, to re-organize, and to write down the capital to a more suitable figure. In this way future profits will be made available for the distribution of dividends instead of having to be applied to the writing off of expenditures charged to capital in earlier years. Accordingly a new company will be formed with a capital of £150,000 in 600,000 shares of 5s. each, instead of the present capital of £450,000. Of the new shares, 431,386 will go to shareholders in the present company, 134,007 to the Matabele Proprietary for the purchase of the Camperdown mine, and 34,607 will be held in reserve for future issue.

On July 1 the new Act relating to the time spent by miners below ground in coal mines came into force, and in spite of many prophesies to the contrary, the coal trade appears to be none the worse. The preliminary struggle for an 8-hour day reckoned from bank to bank, both in and out of Parliament, was a keen and bitter one. Originally it was demanded by the coal miners, who it must be remembered form no small portion of the working class of England, that they should by law be prevented from being underground more than 8 hours out of the 24. The masters objected to this demand, and pointed out that descent and ascent and the traveling along the levels and back occupied a substantial amount of time, which would reduce the actual operating time to 7 hours in many cases. Eventually a compromise was effected, and the law as it stands reads as follows: "A workman shall not be below ground in a mine for the purposes of his work or of going to and from his work for more than 8 hours during any consecutive 24 hours; no contravention of the foregoing shall be deemed to take place in the case of a workman working in a shift if the period between the times at which the last workman in the shift leaves the surface and the first workman in the shift returns to the surface does not exceed 8 hours." It will thus be seen that on an average only half the time occupied in going to and from the face

will be reckoned in the 8 hours. Another provision in the Act is that during 60 days in the year the colliery proprietors may demand 9 hours work instead of 8 hours. There is also another section which empowers the King in council to suspend the Act altogether in event of war or national danger, or of grave economic disturbance due to the demand exceeding the supply. The colliery owners would like, as a sort of counterblast to the 8-hour work in any consecutive 24, an enactment requiring the men to come to work when wanted. The colliers are independent men and take wholesale holidays when so disposed, and the employers would like them to be subject to a minimum per week as well as a maximum per day.

DAWSON, YUKON TERRITORY.

Dredge Record.—Yukon Ditch.—Electric & Hydraulic Elevators.—Miller Creek Concession.—Quartz Mines.—Prospecting.

Summer work is now well under way, and conditions point to an increase in this year's gold production. The total output this year may be nearly \$3,750,000. The water supply has been better than usual, and this is sure to have a good effect on the output. All of the dredges, 10 in number, are doing excellent work, and the result of hydraulic mining for the season, has been, on the whole, satisfactory.

The big ditch of the Yukon Gold Co. is behaving splendidly, delivering at the present time 4000 miner's inches of water at the Klondike, where part of it is being turned into



Map of Alaska.

the river on account of lack of equipment. This is unfortunate, but owing to transportation difficulties it was impossible to land the required pipe in time to get the earliest use of this water. The fact that the ditch will deliver such a large body of water the first year is gratifying. There have of course been breaks, and ditch-troubles of various kinds, but so far they have not been serious. The several inverted siphons have all stood the test of a full head, and are giving little trouble and no anxiety. The new unit which was added to the power-plant this spring is working well, so that there is plenty of power on hand for all needs. The company has at present seven dredges at work, and so far as can be found they are all doing good work. The electric elevators, of which two are working on Bonanza creek, are handling lots of rich dirt. Both of these elevators are soon to be moved ahead and started in a new cut. This will possibly take some time, but it is understood that the engineers in charge have arranged for every contingency. No unnecessary time will be lost. An Evans hydraulic elevator is now being installed on some of this company's property on Bear creek. It is almost ready for work, and will use water from the main ditch, with the big head that will be available, and also a large volume of water.

The Canadian Klondike Co.'s dredge on the Boyle Concession at the mouth of Bear creek is doing well. This boat has always been a success. It is working under unusual advantages for this country, for the ground is not frozen, and it will be several seasons before they are compelled to thaw, if indeed this ever becomes necessary.

The Lewis river dredge on Bonanza creek, of which Edward Simpson is resident manager, is also having its usual success. It is expected that this will be the last year for this dredge at the point where she is now working. With good luck this ground will be all dredged out this fall. The understanding is that they will remove the boat to other property which they own this winter. The dredge has done noble service in the past. The Bonanza Basin Gold Dredging Co.'s dredge is trying hard to beat the excellent record made last year. They are moving lots of dirt, and the value of the ground is believed to be satisfactory. This boat has good management. J. A. White, an old-time Oroville dredge-master, is in charge of the boat, and James Wortham is resident manager. The dredge working on Stewart river is generally understood to be progressing satisfactorily. Gratifying results are being obtained by the Walkers Fork Gold Dredging Co. The difficulties of last year have all been overcome, though the boat is not yet working up to her supposed capacity. The disappointment in the boat is, however, overshadowed by the output, which has been quite up to the mark this season.

On the whole, dredging in this region, in the face of the frozen condition of the gravel, must be called a success, and from year to year, as conditions become better understood, its success is being made surer. Intending investors should bear in mind the necessity of securing up-to-date dredges. They should not allow themselves to be influenced by small outside concerns that will build 'just as good' a dredge for less money than the well established types.

In the Sixty-Mile country, on the N. A. T. & T. Co.'s property, better known as the Miller Creek Hydraulic Concession, considerable work is being done. This company expects to install a dredge as soon as the ground can be prepared for successful working. The work at present consists of stripping the gravels of the overburden of glacier muck by hydraulicking, and thereby exposing the underlying gravel to the heat of the summer sun, which quickly thaws the gravel, thus avoiding the necessity of artificial thawing. Gratifying results are being obtained in this way. On Glacier creek there is a good deal of mining in progress in a small way. Some operators have been particularly fortunate during the past winter and have fat pokes to show for their strenuous life. Among the most successful are Pete Allen and Edgar Searle. This is the most prosperous outlying district in the Yukon Territory. It is 65 miles west of Dawson and $3\frac{1}{2}$ miles east of the Alaskan boundary line, and is reached by a wagon-road from Dawson.

Work is progressing well on the two quartz properties now being developed in this district. The tunnel that is being driven to cross-cut the five parallel veins owned by Hartman and Davidson on Lombard creek is now in 550 ft., and it is expected that the first vein will be cut within the next 150 ft. At the present time 9 ft. per day is being made. The tunnel is $4\frac{1}{2}$ by 6 ft. The equipment consists of two No. 5 Model C and three No. 3 Model C Leyner drills, a six-drill compressor, and a 60-hp. boiler; also a complete electric plant which furnishes light throughout the tunnel. A great deal of interest is centered in the success of this enterprise. On the Lone Star group, controlled by Dr. Catto, of Dawson, work is going steadily forward in a conservative manner. A 2-stamp Hendy prospecting mill has lately arrived in Dawson. This will be installed as soon as possible, as there is considerable good ore on the various dumps.

If as good prospects as are being found on the divides between Bonanza, Hunker, Sulphur, Quartz, and Dominion creeks were found anywhere in Nevada, for instance, there would be a camp of considerable size there within a month, but up here it is hard to change conditions. The placers must be worked out before the great development of the quartz veins can occur. This day is not far distant. Gold ore of good assay value is constantly being brought into Dawson from the surrounding country. There is no reason why permanent veins should not be found along the foothills of the 'Rockies', which lie 20 miles to the north and 50 miles to the east of Dawson. Rich 'float' is constantly being found along these hills. What is needed is efficient prospectors.

SALT LAKE, UTAH.

Smelter for Pioche.—Boston Con. and Utah Copper Merger.—Ohio Copper Mill.—Bingham Properties Consolidate.

A number of unavailing efforts have been made to provide a smelter for the Pioche mines. The question of a custom plant being constructed by the Utah-Nevada Co. is not taken seriously here. It is believed that Samuel Newhouse will be able to get the officials of the Ohio-Kentucky and Nevada-Utah together on a consolidation of interests in that district. Recently some officials of the Prince Consolidated held a conference with William A. Clark in New York, and it was agreed that the spur-line should be built from the terminal at Pioche to the Prince properties. It will be about ten miles in length, the mining company to do the grading and lay the ties, and the railroad company will lay the rails as soon as this work has been completed. The Prince company will get a refund for building the railroad in the form of rebates on its ore shipments. The question of a smelter was taken up at this conference, and Mr. Clark took a lively interest in it. He is now in the West and will go over the Nevada mining camps with a view to deciding upon the location of a custom smelting plant. Bullionville has been mentioned as a probable site for the furnaces. It is understood that Mr. Clark favors Las Vegas, as it will be nearer the centre of a site from which ores can be treated from Goldfield, Tonopah, Pioche, Searchlight, and other points touched by his railroad line. He expressed a desire to build the smelter on his own account, and had no hesitancy in saying that he believed sufficient ore could be obtained to keep a large smelter employed for a number of years. He has had his engineers in these camps for several months past, and he will check up their reports on the ore obtainable on this trip. He has instructed the Pioche shippers not to make contracts on their ore for more than one year from date.

Upon the return of Samuel Newhouse to this city, from his Eastern trip, he could not be induced to give out a statement regarding the consolidation of Boston Consolidated and Utah Copper. He said this would be a matter to be decided by the executive committee of the Boston Consolidated, and after they had reached a conclusion on this point, the directors might decide to submit it to the shareholders. Locally it is believed that the time is not ripe for a merger of these companies. David C. Jackling, general manager and vice-president of the Utah Copper, still insists that the directors of his company have not been considering any proposition for a consolidation of mines at Bingham; that it may be a matter that will be taken up later, when the Utah Copper steam-shovel operations have worked up close to the Boston Consolidated end-lines. At this time he can see no advantage to his company from joining interests with the Boston Consolidated. The general impression among mining men is that the Boston company is willing, but it is conceded that the Utah Copper can best afford to go on alone under existing conditions. When Colin McIntosh, general manager of the Ohio Copper, returned from his visit to the Eastern offices of the company, he was annoyed at the delay in the arrival of material for the steel trestle, which forms the connecting link between the mill and the Mascotte tunnel. He said they could not hope to have this work completed for several months. He has ordered the material for the second unit of the mill, which will be placed in position as fast as it arrives. The first section has been completed, and within 90 days they expect to have half the mill ready, and two sections will be commissioned at the same time. Development work on the third, fifth, and seventh levels in the mine is being continued, and the raise on the vein from the tunnel-level will complete connections in time to have the ore dropped down into the ore-trains by the time the mill construction is finished. Mr. McIntosh says that they succeeded in raising all the money they will need to complete the work now in hand.

An agreement has been reached by which the Bingham Metals and the Bingham Central Standard companies are to be merged. The holding company is to be known as the Utah Metals Mining Co. Transfer offices will be maintained

in this city and in Boston. Bingham Metals will get share for share in the transfer of stock for the new shares, and the Bingham Central Standard will be transferred at the rate of three shares of old for one of new stock. The two companies will own a combined estate of more than 4000 acres of patented ground. It extends from Carr Fork canyon over the range into Middle canyon, and will be within three miles of the International smelting plant. A mill will be built, and the Bingham Metals tunnel, now penetrating the mountain 3000 ft., will be continued to the Central Standard ore zone, which it will cut at a depth of 2300 ft. This tunnel can be utilized by other Bingham mines that may want to get greater depth, or to transport ores to the International furnaces. It is double tracked, is 9 by 9 ft., and has a drain of several feet under the track. It is carrying off 900 gal. of water per minute, and this water is utilized for power to operate the ore-cars, run the saw-mill, and provide light and power for the mines. This flow will be increased to 10,000 gal. when the mountain is opened on both sides. Ores will be shipped from the Central Standard mine through this tunnel to the smelter at a cost not in excess of 6c. per ton.

GOLDFIELD, NEVADA.

Hampton Stope.—Florence-Goldfield Mill.

At the present time a large production is being made from the Hampton stope and other parts of the Combination mine, as well as from the stopes opened from the southern extension of the Red Top workings and on the Lucky Boy claim. On the Laguna, extensive work has been started from the Hazel shaft at a depth of 720 ft. by the Chicago Cleveland Co., under the management of William MacKay. Ore of high grade was found near this shaft at 718-ft. depth, and the Consolidated is driving toward this ground from the Clermont shaft at the 600-ft. level. The Moore lease shaft on the Combination No. 2 is down 573 ft., where a station has been cut and drifts started.

At the Florence Goldfield mill everything is in readiness for the installation of the additional machinery upon its arrival, and it is announced that either a belt-conveyor or an aerial trolley will be installed to carry ore from the Little Florence shaft to the mill-bins. This conveyor will be operated by gravity, carrying the ore to the elevated bins. The main shaft at the mill is now being enlarged to a depth of 530 ft., and this work will probably occupy another six weeks. The shaft will be equipped with automatic skips, interchangeable with cages. At a depth of 450 ft. the Victor shaft of the C. O. D. Consolidated has penetrated the ore-shoot which has been productive at the upper levels, and production from the 200, 300, and 450-ft. levels will be resumed shortly. The ore carries a high percentage of gray copper and is of shipping grade. East of and adjoining the Blue Bull, operations on an extensive scale have been resumed by the Goldfield Imperial Co., and the shaft will be sunk to depth. At the 100-ft. level three strong veins are exposed containing ore of low grade. Three miles to the east the Pittsburg Nevada is developing a vein at 300-ft. depth. Several other mines in this neighborhood have resumed work recently, and on the Red Mountain belt the Nancy Donaldson shaft is down over 100 ft. and has exposed some ore of good quality. Shall shipments of high-grade ore have been made lately from lessees operating on the Velvet and St. Ives claims of the Goldfield Merger Mines Company.

MEXICO.

La Blanca, Pachuca.—Floods.—Labor Shortage.—Cananea Consolidated.—Mexican Mining Institute.

We understand that John Hays Hammond has confirmed the report regarding an option for purchase of La Blanca mine, Pachuca, mentioned last week, and that the intending purchasers are the English capitalists who control the Camp Bird mine in Colorado. The engineers are making an examination of La Blanca, and as it is the general belief that the property will stand the most rigid examination, it is probably simply a question of terms. The entry of

these people into Pachuca must mean much for the future of that city.

For several months during the early part of the year almost the entire Republic, by reason of the lack of spring rains, suffered from shortage of water and a curtailment of operations. Finally the rains and the floods came, during the last days of June and early July, with many wash-outs of wagon-roads and railroads, the losses reaching perhaps into the millions, and transportation was at a standstill. In addition to these troubles were those with the laborers, many of whom, when the rains came, left their usual occupation to sow and cultivate the little ranches in which they or their families are interested, with the result that many mines, mills, and other enterprises have had to curtail operations, and even shut down altogether. The Mexican peon is a difficult subject to hold steadily to his work. His observation of the national and church holidays is notorious, and these are so numerous that it is difficult for a large concern, particularly a smelter, which must keep running, to figure how they may pass certain holidays. Even this, however, is not as difficult a matter as it formerly was, the foreign influence apparently having reduced enthusiasm for the less important days. The question of holidays has been overcome by many companies, especially at the smelters, by a premium system or a bonus to the men who work more than a certain number of days of each month. This method has now been adopted by the Cananea Consolidated Copper Co., with excellent results; each man who works a minimum of 26 days during the month receives, as a premium in addition to his regular wage, 50 cv. for each day that he has been at work. This keeps the force together, an important factor where 3000 men are employed, as is the case with the Cananea company. The four days that the men may be absent without losing the premium are so scattered through the month, and among the different men, not all taking the same days, that there is no disturbance or inconvenience. The Cananea Consolidated Copper Co. is now treating close to 3000 tons of ore per day, most of which goes to the concentrating mill, though some goes direct to the smelter. From the resulting matte blister copper is made, amounting to 4,000,000 lb. per month, and containing 50 oz. silver and 0.3 oz. gold per ton. Additions, changes, and improvements are being continually made at both mines and smelter to keep down expenses and make a good showing under the present prices of copper. The ore contains only 2.4% copper, 1½ oz. silver, and 0.01 oz. gold, or about \$7.20 per ton.

Another of the large low-grade propositions in Sonora, that needs like careful attention, is the Moctezuma Copper Co., at Nacozari, which is handling 2000 tons of copper ore daily in its concentrating mill, and is now contemplating doubling the plant. The concentrate goes to the Copper Queen smelter at Douglas, Arizona, as both are controlled by Phelps, Dodge & Co. A short distance north of Nacozari, at Arizpe, the Clancy Bros. have taken over the Santa Rosalia mine, one of the important old producers, and are equipping it with modern machinery for the economical development and working of the property; and at the Belén mines, near Arizpe, a good grade of bismuth ore, running well in silver and gold, is being opened. The Chiapas Mining Co. has completed its 8-mile tram and has resumed shipments. On the old San Agustino a little work is being done. The Bocoachic placers, on which work has been carried on in a small way since 1904, have been taken over by an American company, and it is believed that they will now be worked properly and on a large scale. The Yaqui River Smelting & Refining Co. is preparing to resume operations as soon as the railroad reaches Toledo (now 25 miles from the terminus), when coke and other supplies may be brought in at a price that will admit of economical mining and smelting.

The Mexican Institute of Mining & Metallurgy met in its initial session on Monday, July 12, 1909, in Mexico City for the approval of the constitution and by-laws and the election of officers. There were present some 75 members, and the following officers were elected: president, A. Grothe; vice-presidents: Bernard MacDonald, Fernando Gonzales, and H. S. Denny; the Council: Kirby Thomas,

E. P. Merrill, Leopoldo Salazar, P. A. Babb, R. E. Chism, Victor M. Braschi, E. Ordoñez, J. J. Reynoso, Robert Hay Anderson, E. Girault, Ferdinand Susteric, and Ignacio Ibarguengoitia. The papers read were: 'The Aims and Objects of the Institute', by H. S. Denny; 'Smelting in High Altitudes', by R. L. Lloyd; 'Notes on Cyanide', by A. Grothe; 'Cyaniding Slimes', by Ferdinand McCann. The committee on membership reported a total roll of 115, with many applications not yet acted upon.

BUTTE, MONTANA.

Amalgamated.—Policy of Expansion.—Conditions at Ely, Nevada.
—Butte & Superior.—Greenwater.

Convincing manifestations of an era of industrial expansion for the Amalgamated Copper Co. are beginning to appear, and predictions are rife that John D. Ryan and William G. Rockefeller, successors to Henry H. Rogers in formulating the policy of the great copper company, will soon usher it in. Mr. Rogers was conservative in respect to increasing the properties of the Amalgamated, while Mr. Ryan has always entertained the view that the holdings of the company might be expanded with profit to the concern and to the public. It is rumored that it may not be long till the East Butte company's mineral territory and other property will be ranked among the holdings of the Amalgamated, and to that may be added the Davis-Daly and others in the Butte district. The story that the Davis-Daly concern may be taken over by the big copper company has emanated from interests in the former corporation, yet the policy of expansion for the Amalgamated is firmly expected by many people to materialize surely and quickly. It is pointed out that the prospective absorption of the Butte & Ely holdings at Ely, Nevada, by the Cole-Ryan interests, which have just secured an option upon all of the treasury stock and enough scattered shares to give them control, for 60 days, is significant, Mr. Ryan being president of the Amalgamated company. Another incident giving the proposition weight is found in the news received here that the International Smelting & Refining Co. is behind the building of a railroad from Goldfield to Ely, and thence to Salt Lake City and Tooele.

The Cole-Ryan people own the Giroux Consolidated, which abuts on the Butte & Ely claims, and both the Giroux and the Nevada Consolidated, on the other side of the Butte & Ely, have been sufficiently developed by underground openings up to the Butte & Ely's end lines, to indicate the value of the latter property. The option price has not been disclosed, but the stock rose on sales here from \$1.30 to \$2.10 per share, and the capitalization is but \$500,000, with the par value at \$1 per share. It is understood that the Butte & Ely, besides its 200 acres of patented ground, owns the one big and valuable water-right at Ely.

Direct information as to underground conditions in the North Butte is not obtainable here, but that those conditions are unsatisfactory to some degree is generally understood. It is stated by men who keep watch on mining affairs that the drifts on the 2000 and 2200-ft. levels have been somewhat disappointing, and the opinion prevails that the ore deposits on the lower levels may drop in richness to that of the general average in Butte. If this occurs it will lessen the dividends, and possibly reduce them to not much more than \$3 per share annually while copper remains at 13 cents.

Since acquiring the Giroux Consolidated at Ely, Nevada, the Cole-Ryan interests have started a second shaft on the Alpha from the 1000-ft. level and have finished about a third of it. The old shaft is down to the 1200-ft. level.

Robert C. Davis, superintendent of the Butte & Superior company, is quoted as saying that, "the new strike in Butte & Superior was made in the 1200-ft. level cross-cut about 300 ft. west of the shaft in the main vein. The cross-cut shows 20 ft. of high-grade zinc ore, the same as that opened up previously throughout the property, and is not through the vein yet. Included in this 20 ft. is a pay-streak of ore about 5 ft. wide, with from 5 to 10% copper. The drift west on this same level is now 200 ft. farther than the place from which this cross-cut was run. There is another

100 ft. to go on this drift before the end-line is reached. This will take two weeks."

Information received here from the Greenwater district in Nevada indicates that the camp is about deserted. The Greenwater & Death Valley Co. has been seriously considering the abandonment of its property, and the closing incident of the Patsy Clark copper investment known as the Furnace Range Co. was marked by the recent removal of the engine from the property. The one mine being operated full-handed is the Tecopa, which has been bought by the Graves Bros., of Philadelphia, white lead manufacturers, who contemplate erecting a small smelter near the mine.

The annual report of the Tuolumne company shows that the cash on hand on May 31, 1909, the close of the fiscal year, was \$79,103. During the year the company paid out \$30,512 for machinery and \$40,748 for wages and salaries. The income of the company amounted to \$189,801. The superintendent reports the addition of 400 ft. of shaft and 1615 ft. of other openings, and recommends the sinking of the shaft to the 2000-ft. level and the thorough prospecting of the levels on the way down.

TORONTO, CANADA.

Fire at Cobalt.—Shipments.—Montreal River.—Coal Miners Strike.

Cobalt was visited by a destructive fire on July 2, which destroyed some 200 flimsy wooden structures and rendered a large number of people homeless. Owing to the prompt and energetic measures taken for the relief of the sufferers, little hardship beyond the loss of property resulted, and the mining industry was not to any appreciable extent affected. The devastated area is largely situated on the Nipissing property, and advantage will be taken of the opportunity to explore the ground. When this section is re-built, restrictions will be imposed to prevent the recurrence of the calamity. The loss is estimated at from \$400,000 to \$500,000, with insurances totaling about \$100,000.

Ore shipments continue heavy, the record being again broken for the week ending July 3, with a total of 1016 tons. The heaviest shipper was the Nipissing, with 270 tons, closely followed by the Drummond with 240 tons, the La Rose occupying third place with 112 tons. The latter company has just disposed of the low-grade ore on its dump for \$300,000. An orebody 44 in. wide has been discovered in the Otisse. It is composed of two calcite veins with intervening rock impregnated with leaf silver. It was found in the north cross-cut between No. 1 shaft and the original Sam Otisse vein, and does not show on the surface. The Nova Scotia is having a slight boom in consequence of the finding of a vein 4 to 5 in. wide with rich silver content near the centre of the property, which was found in trenching and has been uncovered for about 90 ft. The company is now erecting a concentrator. At the Temiskaming a rich pay-shoot has been struck on the main vein at the 300-ft. level, the ore showing improvement as compared with the yield from the same shoot at the 200 and 250-ft. levels. The Badger lost its bunk-house, ore-house, and tank by a bush fire. The Kerr Lake Majestic has struck a 2-in. calcite-cobalt vein carrying native silver, on the 112-ft. level, 70 ft. distant from the main shaft. The Davis Silver Co., which holds 170 acres in the southeastern part of Coleman township, has adopted the leasing policy and has leased three properties on five-year agreements, on a 25% royalty basis. Operations are being vigorously conducted on these leaseholds, shafts being down on calcite veins showing silver to depths of 95, 85, and 65 ft., respectively.

Simultaneously with the news of the settlement of the protracted coal miners' strike in eastern British Columbia and western Alberta, where the men have gone back under open-shop conditions under a two-year agreement, comes the tidings of what promises to be a still more formidable industrial conflict between the Dominion Coal Co. of Nova Scotia and its employees. The question is primarily one of the recognition of the United Mine Workers of America, to which the majority of the men belong. This has been steadily refused by the company on the ground that, having its headquarters in the United States, it is practically a for-

eign organization. On the refusal of the company to negotiate, a strike was declared, and the men went out on the 6th. A large number belonging to the Provincial Workmen's Association, a local union not affiliated with the United Mine Workers, remained at work. There are conflicting statements as to the number on strike, but it appears that the total normal working force is 5200, and as the daily output has fallen from 12,000 to 4000 tons, probably the strikers number two-thirds of the whole. Some rioting having occurred, a military force of 500 men has been sent to Glace Bay, and martial law prevails.

BLACK HILLS, SOUTH DAKOTA.

Tin Mining to be Resumed —Harney Peak Receivership.—Spodumene Mining.

Much interest and considerable satisfaction attaches to the announcement that A. R. Ledoux of New York City has started active prospecting upon the tin claims of the old Harney Peak Tin Mining, Milling & Manufacturing Co., which some years ago 'operated' in the southern Black Hills. Had the operations of this company at that time been under the control of such a man as Mr. Ledoux, probably much more would now be known of the commercial possibilities of tin mining in the Black Hills, and it is this fact that gives a feeling of satisfaction at the announcement that he has found capital to back him in his investigation of the tin-bearing pegmatites and quartz veins upon those much abused properties. Owing to the interest which has always attached to the exploitation of tin deposits in this country, it will be worth while to recall some of the circumstances which attended the discovery of tin in the Black Hills and the existence of the Harney Peak company while it was 'mining' near Hill City.

Tin was first recognized as occurring in the Black Hills in 1876, when Richard Pearce of Denver identified cassiterite in placer gold from the northern part of the hills, and in 1877 Fred J. Cross discovered it in material from Elk gulch, in the southern hills. It was not found in place until June 1883, when A. J. Simmons of Rapid City sent specimens from the Etta mine, $1\frac{1}{2}$ miles south of Keystone, to San Francisco for determination. The Etta claim was at that time being prospected for mica. Shortly after this, tin was found in place at Nigger Hill, since called Tinton, but at that time well known for its rich gold placers, part of which had been discovered by colored men, whence the hill received its name. Soon after the discovery of tin at the Etta mine, in 1883, a number of companies was formed to mine the metal. These companies were finally consolidated into the Harney Peak Tin Mining, Milling & Manufacturing Co. English money to the amount of \$3,000,000 is said to have been sunk in the enterprise, and the amount of American money is unknown. Offices were established at Hill City, and a great number of claims, said to be about 1100, averaging 10 acres each, with a total area equal to 9 by 15 miles, were purchased, over a length of 30 and a breadth of 10 or 11 miles. According to stories told me by parties who sold claims to the company, but little showing of cassiterite was required to make claims salable at ridiculously high prices. Claims were perfunctorily examined, and vendors were busy hauling rock from claims carrying good ore to less rich properties, and in the lean dumps from the local prospect holes the imported ore was carefully arranged to catch the eye. Old residents say that bonds were taken upon properties offered for sale to the company, and when they came due the vendors were offered a much lower price, which was often accepted, and the deeds which were held in escrow turned over to the company's representative with figures unchanged, and presumably charged to the company at face value. One man told me of bonding claims to the company for \$15,000, and when the bond came due he was offered \$4000 for the property and papers as they were. He accepted, as he was afraid the boom was dwindling. Experts sent by the English stockholders to examine the properties were entertained, 'wined and dined', and shown the best shoots of ore. One man told me of being paid \$100 per day for eleven days to keep an 'expert' drunk, and the man suc-

ceeded so well that at the end of that time the 'expert' went back to England and gave a favorable report. Naturally such tactics could not keep the company going long unless there was a tremendous amount of extraordinarily rich ore at hand from which to draw, but it did last for several years. A number of examinations were made, mostly favorable for the company. It must not be supposed from what has been said that all the men who made examinations were either fools or rascals, for some of the men were of the best obtainable, but the ores are of such a nature that it is extremely difficult, if not impossible, to get an adequate idea of their average richness without actual mill tests of large tonnages.

Mills were put up about a mile east of Hill City and at the Etta mine, near Keystone, at a cost of many thousand dollars. The Etta mill alone is said to have cost \$235,000. Shaft-houses, boarding-houses, and other buildings necessary for large operations were put up on the Etta, Matteen, Gertie, Cowboy, Addie, Mohawk, Coates, and other claims; work was undertaken on a considerable scale, and thousands of tons of pegmatite were broken down. This was easily done, as the pegmatite may be drilled and blasted readily, and, lying, as it does, between schist foliae, it breaks with excellent smooth walls, and the high dip of the dikes makes stoping easy. Five thousand tons of ore which had been hauled from the various prospects was put through the mill in 1892 and yielded only one-fourth of one per cent of metallic tin. This was in great contrast with the estimates made by various men who had examined the properties, and was blamed to loss through unadjusted new machinery. Estimates had been made by different examiners, which ran from 1 to 6% of metallic tin, though the ones bearing most evidences of reliability were between 1 and 2%. The company went into the hands of a receiver in the summer of 1894, and remained under the control of the court until this spring. A large proportion of the claims were allowed to lapse, as they were not considered worth patenting. Others, about which the receiver had supposed there would be no question as to patentability, when money should be on hand to pay the expenses, are still unpatented, and have been attacked by the Forest Service as non-mineral lands. Almost the whole Black Hills region is in a forest reserve.

During the entire operation of this company probably less than five tons of metallic tin was produced—a less weight than that of the English money put into the venture (not to mention the American cash) would show if in the form of gold coin. What became of all this money? Undoubtedly a considerable sum was spent for claims, machinery, buildings, and mining, but if reports are to be believed, extravagance ran riot. A friend, who lived in Hill City at the time, told me that he one day met the general manager, now dead, who said to him: "———, do these fellows give you anything to drink here?" "Not much," replied my friend. "Well, I don't see why. I sent them \$200,000 a few weeks ago, and they have drunk it all up." Undoubtedly the language was more or less figurative, but locally it was the accepted way in which the company's money was supposed to be spent.

Since the collapse of the Harney Peak T. M., M. & M. Co., a little tin has been taken out of the placers, both at Nigger Hill (Tinton) and in the southern field. One company, the Tinton, has endeavored to work the lode deposits at Tinton, and several companies have attempted to work the Gertie claim, one of the claims allowed to lapse by the Harney Peak company, at Hill City. Litigation has made an already difficult situation worse, and little in the way of production has been accomplished at either place. Unluckily for the development of the properties, the court has allowed neither the leasing nor the working of the properties during the whole time of the receivership, with the exception of the Etta claim, on which tin was first discovered in place, and this has not been mined for tin, but for spodumene, a lithium mineral from which lithia salts were made. The spodumene crystals are immense, often 30 ft. long and 6 by 3 ft. in cross-section.

The mills show the effect of long idleness, and much of the machinery has been removed. It is to be hoped that Mr. Ledoux will develop enough ore to make these old mills shake their dusty joints and get to work.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Storage of coal under water prevents loss by oxidation. It thus retains the heating efficiency and serves to prevent spontaneous combustion. Shipment of coal at sea in flooded bunkers has been tried, and gas companies in Germany are now storing slack in flooded steel tanks. The average saving in combustible material by this system is reported by one gas company to amount to over 4 per cent.

Magnetic oxide of iron (Fe_3O_4) is formed to a small extent in copper smelting, and often appears in the matte, usually being more abundant in those of low than of high copper content. The slag, however, contains more of this substance than the matte. The method by which Fe_3O_4 is formed in smelting is still undetermined. It is commonly supposed to be formed in roasting, and subsequently to fail of being reduced in the smelting furnace.

Tuffs, representing volcanic rocks in a finely comminuted condition, are favorable for chemical reaction with waters traversing them. The complexity of composition promotes the chemical activity. Hence cases are known where tuffs in contact with limestone have been the precipitating agent for copper brought in by ascending solutions. Normally, contact copper deposits on the borders of limestone beds would occur in the lime rather than in the rock of igneous origin.

Gold in the lower desert portions of California is commonly associated with tungsten minerals, while tourmaline is generally absent. Tungsten is particularly in evidence at Randsburg, where extensive mining operations have been conducted for many years by the Yellow Aster company. It is also found in the old Amalie district, in the Tehachapi mountains, and in the veins around Silver mountain, near Victorville, where renewed activity is taking place. These are all in granitic areas, intruded by eruptives, mostly trachytes, with some andesites.

Concentration of slime varies according to the physical character of the pulp. The degree of fineness of the pulp, the amount of alumina in the form of kaolin, the quantity of sericite, and of colloids, exercise an important influence. Efficiency of concentration of slime is dependent upon the rate of settling of particles of the concentrate through the pulp, diluted to the extent required for treatment on tables or vanners, but the rate of settling is not necessarily a function of the specific gravity of the pulp. There are interferences of a complex nature which have been only imperfectly studied.

Retort reduction of quicksilver ores has been almost universally superseded by treatment in shaft furnaces, fitted with shelves for feeding the ore from the side, owing to the extremely limited capacity of retorts. The disadvantage of direct-firing is the great volume of heated gas to be cooled, and the soot and other solid matter in the fume, upon which

quicksilver is condensed and carried out into the atmosphere. The flue-gases are cooled to 60°C . Rotary furnaces will soon be in operation in California, and experiments are being tried with electric furnaces, heating tile-supports with resistance coils, so as to dispense entirely with furnace gases. The latter plan is being worked out by H. C. Davey of Los Gatos, California.

A lode-claim is located by C, who describes it as being 1500 ft. long, and as being bounded on the south end by the claim of D. It is, in fact, less than 1500 ft. long. D later abandons his claim. Can C amend by including enough ground from D's abandoned claim to make a full claim, no adverse rights having attached? The ground embraced in D's location was rendered open to location by his abandonment, and C could locate the whole of it as a new location, or incorporate a part of it in his existing claim by amendment.

Bornite is stated to have been found as an original constituent of certain gabbros, but this is open to doubt. Not only may bornite be formed by reaction between pyrite and copper salts disseminated by diffusion through a rock, but it will form in films of such infinitesimal thinness on the parting planes of pyrite and pyrrhotite that the crystals will possess the lustre of bornite, no matter how finely they be broken. Rocks containing pyrrhotite usually carry copper also, and it is well to test suspected bornite in such situations with a magnet. As small a quantity as 0.2% copper will stain pyrrhotite so that it will appear to be pure bornite.

Settling of sand from pulp may be facilitated by causing the pulp to flow through launders the depth of which is great compared with their width. The lower two-thirds of the launder should be fitted with baffle-boards with 2-in. spaces between, inclined at an angle of 60° in a direction opposite to that of the flow. The settled sand should discharge continuously by siphons placed at intervals along the length of launder. The principle of the settler consists in the formation of eddies at the head of each compartment, out of which the sand settles upon the board and then slides to the bottom, undisturbed by currents in the surrounding water.

Can two lode mining claims, located along the strike of the same vein, be based upon a single discovery made at the point where the vein crosses the common end line? This question has never been authoritatively decided by the courts. The view of the Land Department and the best opinion of text writers on the subject, however, is that a discovery must be viewed as an entirety, and that a single discovery cannot support two mining claims. Both claims, therefore, cannot be valid, but it may be that the locator or locators would have the right to elect upon which of the two claims to credit the discovery, and that one of the claims might be upheld. The safer method, however, is for the locator to make an independent discovery entirely within the limits of each claim. If either claim is void for lack of discovery, the ground embraced therein is, of course, open to location.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

What Is an Ore?

The Editor:

Sir—I am loath to enter the arena to discuss geology with the man from whom I learned all the geology I know. I am sure that I am only one of a host of engineers who read J. F. Kemp's articles with avidity, in my case increased by a keen sense of all I have forgotten in the fourteen years since I heard the sound of his voice in the lecture-room. The paper on 'What Is an Ore?' brings home very forcibly the elusiveness of our ideas on the subject. We have always been ready to give a definition of 'ore'. The number of authorities quoted by Mr. Kemp shows how inexact and varied are these definitions. I desire to offer a suggestion, and I assure you that my knowledge of Mr. Kemp's kindly character does not lessen the trepidity I have in doing so.

He states that "use is the law of language." By which we understand, that in defining a word the correct value is that placed on it by the persons most familiar with it. On that basis, it seems to me that the conclusion that "the test of profit" meets the requirement of a standard, is unsatisfactory. Comparing the various definitions quoted in the paper, we find the subjects approached from several standpoints. Some of them can be left out of further consideration, but there are two classes, representing two different ideas, which are worthy of further consideration. One class is that advocated by Mr. Kemp, and takes as the absolute standard what may be termed the metallurgical viewpoint, namely, the ability to treat the stuff at a profit. The other is that represented by the definitions of Van Cotta, Stretch, and Louis, in which the test of profit is not the sole criterion. Stretch's definition, in my opinion, conforms more nearly than any of the others to the generally accepted usage of every-day mining life. He says: "Among miners, whatever will pay to treat, or ship and sell, is considered ore, as also low-grade mineral which might be utilized by concentration or improved facilities, but there is an indefinite shading off into material containing traces of ore minerals but hopelessly unavailable, and this would not be considered ore." The objection Mr. Kemp makes to this and some other definitions, is that a shifting standard is introduced. That no doubt is true, but the question that presents itself is: Can a satisfactory standard be established by means of which the word can be defined upon a 'secure and unmistakable basis'? By this, it is to be presumed, it should be so unmistakable that even the veriest novice would be able to know ore. In attempting to do this, I think we are immediately confronted with the impossible. So far as my experience goes, the generally accepted sense of the word ore, among miners, cannot be enclosed in a ring fence. It is elusive to the point of shading off into mineralized country rock.

Before proceeding let us enquire into the exact intention of Mr. Kemp's expression when he states, "capable of being won at a profit." The whole definition hinges on the word 'capable'. It surely is open to all the objections of indefiniteness that have been raised against some of the other quotations. Does he mean, capable of being won at a profit anywhere in the world, or at the particular mine under discussion? Are we limited as to time, or does it exclude the question of time? Near the bottom of page 419, second column, we read: "Is not 20% iron considerable, yet it would not warrant mining? Is 0.0008% considerable, yet it might justify mining for gold?" In the first portion of this quotation it would appear that he does not intend any limitation as to situation; in the second, rather the opposite is implied. In neither case does it appear that "the test of profit" is an "unmistakable standard," and the indefiniteness of the word 'capable' is likewise exemplified. In the succeeding paragraphs I will attempt to show, by a series of examples, that "the test of profit" from the miner's standpoint does not meet the requirements of a standard.

Mr. Kemp states: "In a new enterprise, as we all know, it is customary to refer to the mineral in the ground as 'ore', before it is proved to be such by profitable operation." Is it not a fact that this is by no means limited to new enterprises, but is used in connection with old ones as well? The average miner differentiates between ore and country rock, further classifying the former as payable and unpayable. It is a matter of common usage to speak of filling stopes with low-grade ore, meaning thereby that portion of the orebody that does not pay to raise to the surface. Engineers the world over, in valuing mines take into their calculations as 'ore', material that of itself is nowhere capable of being won at a profit, much less at the mine they are valuing. They speak of the limits of the ore-shoot, as representing that portion of the orebody which under existing commercial conditions will pay to mine. That portion of the vein or lode outside the ore-shoot which carries values, even though the values be unpayable, they are likely to describe as low-grade ore. This is a world-wide custom in mining districts where English is spoken, and to my mind is enough to throw out the "test of profit" basis. In the strictest sense of Mr. Kemp's definition, two adjoining mines, working exactly the same ore, one at a profit and one at a loss, would be yielding ore only where working at a profit. We know of the recent great reduction in working costs on the Rand, rendering available for treatment a large quantity of quartz that hitherto was considered unpayable. In the same issue of your paper, in an editorial you speak of the 'ore' reserves of these very mines having been increased by this reduction of working costs. Ore reserves cannot be increased except by ore. If it is ore today, was it not ore yesterday, at least from the miner's standpoint, if not from the metallurgist's?

An aspect that should not be overlooked is the question of impurities in varying percentages, that interfere with profitable working. Near Zeehan, Tasmania, is a mine containing a large deposit of mixed lead, copper, and zinc sulphides carrying silver. The

greater part of this deposit is not being mined on account of treatment difficulties. Despite the fact that the treatment trouble has not been overcome, every engineer who has seen the mine would speak of this at present unpayable mineral as 'ore'. The San Francisco del Oro mine in Mexico has a shoot of ore of great length, but it likewise has not been mined at a profit because of metallurgical difficulties. From the metallurgist's standpoint, the material in the vein may not be ore, but a number of engineers of repute have gone on record, describing the mineral as 'ore', and by the miner it would unquestionably be called ore, despite the fact that it nowhere has been won at a profit. Again, we have a mine containing ounce gold 'ore', yet the physical conditions are such that it cannot be mined at a profit. Ounce gold ore would be considered high grade in most places. At the Spanish mine in California I believe that some years ago they mined and milled at a profit gold ore that only yielded 75c. per ton. Therefore, in the broadest sense of Mr. Kemp's definition, "capable of being won at a profit," we may say that any quartz carrying ¾ dwt. per ton is 'ore'. However, without cavil, I may say that most mining men would not so denominate a quartz body of that value. Despite the unprofitable character of the former as compared to the latter, no miner would hesitate to call ounce ore 'ore', whether it happened to be payable or not.

The case of the great Mt. Lyell mine is worthy of note. The present company is a consolidation of the old Mt. Lyell company and the North Mt. Lyell company. They had been unimportant producers prior to the year 1903, but increasing metallurgical difficulties threatened the ruin of both concerns. The matter was entirely one of the proper fluxing of the ores. The Mt. Lyell mine is an enormous deposit of pyrite containing copper. As long as they were able to get suitable acid fluxes from the other mines they controlled, all went well. The North Mt. Lyell mine ore used to average about 8 to 10% of copper, but it is silicious. As long as they were able to get suitable basic fluxes, all went well with them also. The time came with each property when the flux question became very serious, and unless a suitable smelting mixture was obtainable, both mines must shut down. It will be recalled that in 1903 the price of copper was low. Since the date of the consolidation, namely, August 10, 1903, until September 1908, there have been treated the following tonnages:

| | Tonnage. | Assays | | |
|---|-----------|--------|---------|---------|
| | | Cu, % | Ag, oz. | Au, oz. |
| Mt. Lyell Mine | 1,463,244 | 0.91 | 1.89 | 0.071 |
| North Mt. Lyell and Lyell Tharsis | 583,920 | 6.08 | 1.72 | 0.0052 |

A total of 2,047,164 tons of 'ore'.

The ore reserves are stated to be:

| | Tonnage. | Assays | | |
|-----------------------|-----------|--------|---------|---------|
| | | Cu, % | Ag, oz. | Au, oz. |
| Mt. Lyell Mine | 3,382,117 | 0.54 | 1.96 | 0.030 |
| North Mt. Lyell | 710,333 | 5.75 | 1.33 | 0.005 |

That statement goes unchallenged by the mining community, as does the statement of the tonnage of 'ore' treated. I cannot imagine even Mr. Kemp denying that this mineral is and was ore, although either one may be incapable of being won at a profit under

the conditions usually prevailing at Mt. Lyell. Whatever one may say regarding the pyritic orebody, which now averages only 0.54% copper, against about 1% at the time of the consolidation, it is certain that no one will gainsay that the mineral making up the tonnage and value of the North Mt. Lyell ore is 'ore'.

To quote only one other instance of the numerous examples that may be cited: the low-grade copper deposits of Nevada were for a long time not classed as ores, and with reason. Notwithstanding their successful exploitation in Nevada, material of that character would not ordinarily be classed as ore, unless existing under similar conditions.

Mr. Kemp in quoting Louis' definition, comments as follows: "If you saw a pile of magnetite at a blast-furnace, being successfully treated, you would call it an ore, even though it had been bought at the bankrupt sale of some miner." He is entirely right, and he sums up the consensus of mining opinion in that statement. The material is 'ore', despite the fact that the miner was unable to make a profit out of it. I submit that Mr. Kemp's "test of profit" does not meet the requirement of a technical definition, except from the standpoint of the metallurgist. And even the metallurgist sometimes gets ore that he cannot treat at a profit. The closing down of the Ponderay smelter within the last few months, because it could not compete with smelters more favorably situated, may be instanced. On the other hand, geological considerations, as well as commercial and physical conditions, affect the miner's standpoint. These include a number of factors, with an almost infinite number of variations, rendering it practically impossible to put into words any exact definition. By which I mean, one which may be applied to any condition that may be met.

The geological consideration, a point that has scarcely been touched by any of the authorities, is one of the first importance to the miner, because the nature of the concentration of the minerals in their native state has an important effect on his attitude. Therefore Van Cotta's description that "Under the general term ore are comprehended all minerals or mineral aggregates which from their metallic contents attract the attention of the miner," has a great deal of merit. If we can make plain what 'attracts' the attention of the miner, we will have an ideal definition. It may be taken as an axiom that the incentive to the miner to work is the profit. It is for this reason that he prospects and develops and exploits a mineral deposit. But once he is 'attracted', the question of profit does not limit his application of the term. He may cease operations when he has no more pay ore, or he may continue his work in unpayable ore, in the hope that his brother, the metallurgist, may find some way of enabling him to make a profit out of the low-grade material. However, as soon as he finds a portion of his deposit amenable to profitable exploitation, he will undoubtedly include under the heading 'ore' a large amount of material that of itself will not yield a profit. His underlying idea, perhaps, is that the discovery of some higher grade material which can be used as a sweetener will enable him to mine his low-grade stuff. The whole question on this basis no doubt resolves itself into a very in-

definite position, but, as already pointed out, I do not think that we can restrict the definition solely to "the test of profit." A broader, if more inexact, basis must be allowed, one which perhaps takes account of personal equation, but which will satisfy the primary fact that "use is the law of language."

I hesitate seriously to offer a substitute for a definition given by so eminent a scientist, yet, for fear of being accused of destructive criticism, I would suggest that, for technical use, the word 'ore' be defined as follows: A metalliferous mineral, or an aggregate of metalliferous minerals, more or less mixed with gangue, that from the standpoint of the metallurgist can be treated at a profit, or that from the standpoint of the miner occurs in a vein, lode, or other geological deposit, and concentrated by nature in such a manner as to attract the attention of the miner, on account of his belief that he can work at least a portion of such deposit at a profit.

There is no doubt a variable factor in this definition, namely, the 'belief' of the miner, but it permits one having a knowledge of the subject to make a fairly accurate estimate of "What Is an Ore?"

C. S. HERZIG.

La Libertad, Nicaragua, May 20.

Santa Eulalia Camp.

The Editor:

Sir—In your issue of July 3, Louis Lane of Chihuahua takes exception to my article on Santa Eulalia as containing numerous errors of statement. Most of these alleged errors he disposes of collectively, apparently not feeling enough interest in the readers of the 'Press' to guide them to the exact truth. In regard to the points which he itemizes, no one could be more appreciative of any contributions to the sum of human knowledge than myself. As to the average value of the ores being exported from Santa Eulalia in February 1908, the time of my visit, my statement is based on information received from several successful mine operators of the district, whose names can be given if necessary. Of ores in reserve I have no knowledge, although I was aware that occasional masses of rich ore had been found. It is to be hoped that Mr. Lane, with the possibilities of more complete knowledge, will give an extended record of the values carried by average ores from the different mines. His point about silver having a higher gold-value in the 18th century than at present, is well taken, as well as his expression on the cost of labor, but we must not forget that the methods of metallurgical treatment were then very wasteful. Probably in the primitive furnaces used in Spanish days not more than 50% of the metals were recovered. It is, I believe, a fact beyond the possibility of controversy that the old slag dumps of the Santa Eulalia furnaces were for many years worked as a placer field for silver globules which had been locked up in the slags and released by the action of the weather.

As to the origin of the limestone conglomerate, in regard to which Mr. Lane differs with me, that must remain a matter of judgment. Of the faulting, there can be no question. The greater fault I mention was observed by Robert T. Hill. Kimball's observation

on the dip of the strata is given solely on his authority, as I had not time to verify it. The statement regarding Sierra Mojada, though confusing to Mr. Lane, may not be so to all. In conclusion I would say, with some regret, that Mr. Lane appears to belong to those who rest in enjoyment of their information, only caring to speak when someone, attempting to help his fellows, and publishing the best facts he can obtain, falls a little short of complete accuracy. If my critic would make public all available accurate information on Santa Eulalia, he would be a true benefactor.

New York, July 8.

F. J. H. MERRILL.

Civil Service Reform.

The Editor:

Sir—The editorial entitled 'Civil Service Reform' in your issue of July 10 admits of criticism since, rightly or wrongly, the opinions there expressed may be considered reactionary. Reduced to its elements, your proposal is to strengthen the hands of departmental chiefs, giving full managerial responsibility. As a means to this end you propose that the bureau chief be empowered to select and discharge employees. The selection would of course be made from those constituted as eligible by success in passing the Civil Service examinations. Discharge would be 'for cause', at the discretion of the responsible head. The effect of such a system would be to create a new dispenser of patronage, in place of the congressman of earlier days. It would exaggerate the importance of these officials, and convert their posts into coveted political plums. The familiar college expedient of 'boning' for examination would be applied, with all its absurdities and tricks, to give a candidate for a clerical position that status which would enable his appointment to be made. The incompetency resulting from unrestrained favoritism might not exist as in the past when the spoils system prevailed, but the proposed method would be open to grave abuses. It assumes also that a manager can select men by some power of insight deeper than a system of rigid examination. Superior vision of this sort few men possess. There is no more difficult thing than to pre-judge human character and capability. The man who can do it rises speedily above the level of a bureau chief.

Long experience in management has shown me, and I am certain it must have shown the same to many, that the power to select subordinates is not the prime requisite for successful administration. Given any rational system of honest enquiry into character and attainments, the chances of drawing efficient men are excellent. The real disciplinary power lies in the right to dismiss from service without appeal. Winnowing conducted by such a method will soon yield an active and capable corps. But the power of free selection, even from a list of eligibles, would infallibly restore the evil of favoritism. The Civil Service should establish the rank of eligibles as to grade of efficiency and priority, and they should be available in that order and not otherwise.

C.

San Francisco, July 19.

MINING IN NORTHERN SINALOA, MEXICO.

Written for the MINING AND SCIENTIFIC PRESS

By E. A. H. TAYS.

Outside of a strip of land, averaging 40 miles wide, parallel to the coast, the State of Sinaloa, Mexico, consists of country which in the United States would be classified as mineral land. The east boundary does not reach the Sierra Madre proper, though many ridges reach 4500 ft. above sea-level; the formation therefore is open for inspection, that is, it is not buried by hundreds of feet of tuff, as is a large part of the main Sierra range. This makes prospecting easy, and as there is here a zone 40 miles wide on each side of the Sinaloa east boundary line, well

ing it may be, if it does not promise to pay daily wages from the start.

A number of prospects are being developed and, at times, considerable ore is shipped, but shipping is restricted by the fact that it takes \$50 ore to pay. The new railroad will better this condition materially, and will also help to start the general development of the mineral resources of the West Coast. The line extends along the western limit of the mineral belt. The districts of Fuerte and Sinaloa are rich in precious metal veins, from the Southern Pacific railroad line, east to the State line. From the time one crosses the Sonora line into Sinaloa mineralization is apparent on every side. The railroad runs by the main shaft of the old Sivirijoa silver



Northern Sinaloa, Mexico.

mineralized and practically virgin, running in a southeasterly direction for 50 miles, one can readily see that this section holds great opportunity for prospectors. The northern part of the State of Sinaloa, which is covered by this article, embraces the districts of Fuerte and Sinaloa. I have said that this section is practically virgin, and it is true, despite the fact that one rarely sees a vein that fails to show some signs of someone having been there before.

Much prospecting has been done in years gone by, but little development made of any of the many veins to be found. The reason is that the native Mexican prospector does this kind of work as a means of earning his daily bread, and though he incidentally seeks new veins, his main object is bullion; he has little use for a vein, however encourag-

ing it may be, if it does not promise to pay daily wages from the start. The country is open and rolling, with a few isolated hills in the vicinity, none of which reach 350 ft. above sea-level. The formation in the immediate vicinity of the vein is a tufaceous agglomerate, probably andesitic; what the depth of this may be is hard to tell, but it will probably exceed 300 ft., and it apparently rests on grano-diorite. The whole plain for several miles around Sivirijoa is cut by seams and veins, and this condition extends to the river, 20 km. to the east. The railroad has a station at Cañedo, in the centre of the zone.

Just across the river from San Blas, where the Southern Pacific crosses the Kansas City, Mexico & Orient railroad, is an exceptionally prolific zone, on the Buena Vista ranch. The formation is grano-diorite on the north and rhyolite on the south. Here veins of good size are found every half mile, showing a trace of gold and a small amount of copper. Where 2 to 3% of copper is incased in 80% of silver, it usually stays there. There is one promising vein in this zone, the Aquincuare, but it is tied up in a lawsuit. There are a number of lodes in the mountains just east and northeast of San

Blas. On the west side the general content is copper, mostly carbonate, but with a fair sprinkling of sulphides. In some of these is to be found lead carbonate and a little silver. On the east side are some lead-silver veins, and a few are to be found showing a little gold. The formation runs from a silicious metamorphosed porphyry to recognizable rhyolite.

Up the river there is not much until Fuerte is reached. Between Fuerte and Choix, a famous old copper-producing town, granite is the predominating rock. East of Fuerte, to the eastern boundary of the district, is the gold zone of northern Sinaloa, both lode and placer. At Realito, 14 miles east of Fuerte, are found numerous veins all assaying a little gold, and all having indications that induce development. Some placer gold is found in this district, but nothing on a commercial scale. The rocks are schistose, but

undoubtedly of igneous origin. Farther east, at Chinobampo, granite is in evidence again. In the Yecorato region is found the only placer ground that promises to be of sufficient size to admit of large operations. Here the arroyo for several miles contains gold, with water enough to permit of dredging. Most of this is now held by an American company which is at work; but, with the methods pursued, it seems doomed to failure, in spite of the fact of there being gold in 'commercial' quantity.

Around Yecorato the underlying rock is granite, with andesites and rhyolites overlying this. In places are large stretches of andesite, especially to the south. Northeast of Yecorato, about eight miles distant, is the Minitas region. Here the granite is the main country rock. It is cut by numerous veins that contain gold; but where these are not small in size, the ore is 'spotty', and nothing of a formal nature has been developed in this region, although a small amount of gold is being shipped continually. To the east and south of Yecorato, for miles, is a great andesite zone, and around Potrero are found several large veins, some containing gold, and others lead-silver and zinc.

In time Choix will be the centre of a large zone of mining activity. To the north and east of Choix is a great granite belt cut by numerous dikes of andesite and rhyolite, and, in places, it is overlaid by an overflow of these rocks, or by isolated layers of other eruptives. In the northern part of this zone is the gold-silver-copper zone of Las Papas. Near the Fuerte river, in the same region, on the Lo de Castro ranch, gold and copper are found. The formation here, in places, is lime, generally in isolated fragments lying on the crests of the andesite intrusions that tore them from their original position. There is here much mineralization, the veins containing mostly copper and gold. Between Choix and Bacayopa is a country showing signs of much volcanic activity, though some lime in place is found in a few localities. These and the intrusive andesites and diorites lie on the great granite base. Here the prospector will find a mineral region that will undoubtedly repay labor expended in the endeavor to 'make a mine'.

Lying to the south of the Fuerte district is the Sinaloa, cutting across the coast-range mineral belt. Gold is here the principal metal. From the old stage road eastward there is hardly a ranch that has not a vein. Right in the town of Sinaloa are found gold-bearing stringers in a schistose igneous rock. Bacubirito can be called the centre of the mineral belt that covers practically two-thirds of the Sinaloa district, and part of Mocorito and Badiraguato. To the north of Bacubirito some thin-bedded limestones are found; and along the State boundary with Chihuahua some granite and lime, and, in isolated spots, metamorphosed schists, with here and there the lower granite showing over extended areas, but, for the most part, the whole region consists of andesite and rhyolite flows, and the breccias of these and other rocks. To the south and west of Bacubirito is the great Mapiri zone, where pockets are found with sufficient frequency to keep the region fresh in every one's mind. However, nothing of any great value so far has been developed. Around the base of this isolated range

much placer gold is found, usually in nuggets. These vary from the size of a grain of corn to masses of 30 oz. However, though placer gold in small quantities is found everywhere, there seems to be no single body of gravel sufficiently large or rich to warrant great expenditure.

The Sinaloa river below Bacubirito should contain considerable placer gold, but the bed is probably so littered with big boulders that dredging operations would be futile. At this place the river makes a bend of 14 km., and comes back to within 200 m. of itself, there being a fall of 100 ft. between the two points. Here is a chance for a hydro-electric installation.

East of Bacubirito the mountains rise to considerable heights, the La Joya peaks in the Ocorahui range being probably 5000 ft. above sea-level. Most of the veins here contain silver as the predominating metal, with considerable copper. North of Bacubirito, 30 miles, is the camp of San José de Gracia, yielding gold. The main formation is andesite, though rhyolite and diorite are also found. This camp has been in operation since 1836, and is one of the most important in the State. Since 1894 modern mills have been operated, and two of the mines, the Jesus Maria and the Rosario, have conjointly shipped, approximately, \$10,000,000 in gold bullion. These veins are not large, but are fairly rich. In this zone are many veins awaiting exploration, some of which promise to turn out as well as their neighbors. To the west of San José de Gracia some 30 miles, is the Cuitaboca zone, yielding silver. The formation here is entirely unaltered andesite. The veins are large, and some of them are sure to develop good orebodies. Only two have been worked, namely, San Antonio and Jesus Maria. The ores are somewhat 'rebellious', but contain from 45 to 70 oz. silver per ton. This region joins the Fuerte district to the north, some 20 miles away.

North of Ocoroni, on the Santa Ana and Tetache ranches, is a practically unexplored zone that promises to respond favorably to prospecting. Nearer the coast are a few isolated ranges on the Tetamecha ranch that also promise much, as many large veins are known to exist. As the Southern Pacific railroad now skirts along the entire west side of the region discussed, and as there are several large valleys running up into the mountains, with trails in every direction, it will be seen that the country is extremely easy of access. One can now leave Denver or San Francisco and in five days time be in the heart of this mineral belt, with no hardships that are worthy of mention.

Tungsten deposits occur in the Black Hills at several places, but have been exploited commercially only at Lead, in the central hills. The valuable ore is wolframite. Tungsten is of especial interest and value in connection with its use in tool steel and as a filament in incandescent electric lamps.

Tin deposits occur in the northern part of the Black Hills of South Dakota at Tinton, and in the southern part near Hill City, Oreville, and Custer. The geology of the deposits has been discussed recently by F. L. Hess, of the U. S. Geological Survey.

PLACERS OF WALDO, SOUTH OREGON.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN M. NICOL.

In the early days the camps of Waldo and Kirby were among the most famous of south Oregon, and apparently reliable estimates place the output of the Waldo district at eighteen million dollars. The only placers of importance which are still being worked are known as the Simmonds, owned by J. T. Logan, and the Weimers, owned by the Deep Gravel Mines. There is also a high bench or old river channel known as Al. Adams placer, which owing to lack of water is only worked to a limited extent. The district is one of numerous beautiful grassy glades, and little flat-bottomed valleys, which wind among a series of low rounded foot-hills, which are in turn flanked by mountains, snow-clad late into the summer months. These mountains form the boundary between Cali-



Logan Placer Mine, Waldo, Oregon.

original topography apparently consisted of wide, deep, and fairly level valleys, which as a result of some change in the drainage plane of the country gradually silted up. The thickness of the deposits varies from a few feet to 150, and the width from a hundred feet or so to several hundred yards. Practically all of the virgin gravels of the district are below the natural drainage plane, and would therefore have to be worked either by driving, by mechanical or hydraulic elevating, or by dredging. The gravel consists of boulders and pebbles from 10 in. diam., down to the finest sands and clays. A most interesting feature, and one worthy of note, is that nearly all of the coarse gravel, and in many places the so-called bedrock conglomerates, are completely decomposed and friable, so that they can be readily disintegrated with a hydraulic giant. The coarse gravel is very evenly distributed over all of the lower parts of the bedrock, and its thickness varies from a few feet up

to 10 or 20. It carries the greater part of the gold and platinum. The overburden consists of finer gravels and some sand, though the bulk of the material is fine sub-angular grit and clay. Handling the large percentage of clay found throughout the deposit is one of the serious problems, both in mining and in gold saving.

The upper and shallower part of the Weimer placer was worked to a considerable extent by a long race, which was excavated by giants, and which discharged into the west fork of Illinois river. Subsequently a considerable body of gravel was mined by Hendy hydraulic elevators until the depth of the gravel penetrated was greater than could be mined with the pressure available. J. T. Logan has taken advantage of two different ditch lines, with different heads to place two elevators in tandem, and by this means

he is enabled to work the deeper gravels. One of the hydraulic elevators has a lift of 39 ft., and operating with a head of 330 ft., uses 11 cu. ft. of water per second, besides taking all the water from two No. 2 giants. The second elevator has a lift of 9 ft., a head of 125, and uses 18 cu. ft. of water per second, besides all the water from the first elevator. This makes the final discharge about 40 cu. ft. per second.

The largest proportion of the gold found is fine and a great deal of it is coated with a film of what is stated to be palladium, and which effectually prevents amalgamation. When a clean-up of the sluice-boxes is made a great quantity of rounded and sub-angular fragments of hematite are found in the riffles, varying from the size of a large pea down to the finest red mud. I collected samples of this, and after screening out the fine material below 40 mesh, and carefully hand-picking the grains to remove any small nuggets of gold, I had the residue assayed. The assays showed that all of this hematite contains considerable gold, platinum, and osmium-iridium. The samples from the small gulches and old benches

fornia and Oregon, and are the source of water supply for the mines. In the spring when the wild azaleas are in full bloom, the charm of the scenery is so great that the engineer, if not the miner, is apt to forget the problem in hand, and to regret that these beautiful green glades must be torn up and washed away to win a few pounds of precious metal. All the flat-bottomed valleys are placers, varying in depth, extent, and richness, but all carrying some gold and a considerable proportion of platinum. The problem in prospecting at Waldo is not to find a placer, or a rich streak, there being probably several million cubic yards of virgin gravel, which contain 20c. per yard; the difficulties faced are in finding methods of working the known deposits economically and at a profit.

The rocks which are most in evidence in the district are serpentine and slate, though there are some fairly large masses of porphyry and some intrusives. In working the low-lying placers, a so-called bedrock has been exposed at a number of places. It is a decomposed conglomerate, the remains of an underlying placer much older than those now worked. The



Deep Gravel Mines, Waldo, Oregon.



Logan Placer Mine, Waldo, Oregon.

were the richest. I found some that would assay from \$200 to \$500 per ton of included gold, platinum, and osmium-iridium. The average of several samples that I took from the sluices of the Deep Gravel Mines gave \$40 per ton.

Whether it would pay to save this product depends upon the proportion per cubic yard; no proper tests have been made to determine this. I made estimates from pan tests that the amount would be from 2 to 10 lb. per cubic yard of gravel. This from a placer yielding 500 yd. per day would give from $\frac{1}{2}$ to $2\frac{1}{2}$ tons of concentrate of hematite. These values would seem to warrant investigation as to the possibility of saving some of the concentrate.

MR. MURPHY ON CONTINGENT FEES.

Written for the MINING AND SCIENTIFIC PRESS
By AN OCCASIONAL CONTRIBUTOR.

"I tell ye, McCarthy," Murphy said one day as they were coming off shift together, "that 'twill not be long now befor ye c'n buy mining stocks with th' sa-ame ca-am sinse iv sayeurity that ye wud feel fr'm puttin' ye-er money in th' Hibernia Savin's Ba-ank out on Ma-arket Strate."

"How is thot?" asked McCarthy.

"Why! don't ye ra-ade th' la-ad Ricka-ard's pap'r anny more? Th' wan that me frind with the purty na-ame Coortenay De Kalb Bain's runnin' now, as a squarehead wud say it. Ye-er not up t' da-ate at all, f'r ye don't know that th' la-ad Cha-ance that I told ye av wance befor, has bin gettin' his bys thegither into a flyin' widge so as t' bra-ake up th' interfere-ence iv th' Nevady la'ads, that seem t' be gettin' away with th' money. Grate excitemint has prevailed. Th' prosaydin's have bin rayported t' be wireless—th' kind that ta-akes th' two cint sta-amps—all over th' world; f'h th' bys have wanted their frinds t' rade what they said.

"It was raysolved an' daysided amid grate applause, that th' tarm 'contingent fay' is a most haynouns one, an' that hereafter it shall be called an honoraryum, excipt in a few speshul ca-ases. Wan iv thim is, that you'll be allowed t' ta-ake th' cement la-ands iv unprotieted feemales, under th' fo-orms av th' contingent fay, f'r ye cud hardly call this an honoraryum. Anither is, if ye can-an't git a la-ad t' pa-ay ye th' full bet annyhow, no matther if it comes heads or tails, ye c'n ta-ake what ye c'n git, with a promise f'r th' rist if ye c'n ma-ake a good raypoort."

"It is also daysided afther a long dayscushun, that full raypoorts must be ma-ade iv everything ye do that raysults in operayshuns. If a mule squeezes over an' stips on th' foreman's feet whin he is tryin' t' crowd past in th' drift, th' raypoort must say so; f'r th' la-ad is apt not t' clime up t' th' back of th' stope, an th' Gra-ake la-ad Papaeruckus may git away with some pyri-ite he thinks is th' pure quill. 'Tis a most scholarly dayscushun, f'r th' la-ads had all bin brushin' up their larnin'. Th' by Gent put across a foine bit iv Frinch, which mint t' ta-ake a tra-ace an folly up th' la-ad who got afther th' windmills, an' ta-ake a fall out iv th' hot-air performers. This created gra-ate applause till th' la-ad Wright, who c'n peddle th' bull himself, came back with a bit in

Latin, statin' there was a hole in th' argymint, or 'twas no sich thing, or wor-rds t' that effect. This created more applause, f'r th' la-ads had bin radin' fr'm their own note-books in outlinin' their suppositious ca-ases, an' it pla-azed thim t' think that maybe they'd not done so wrong afther all. 'Tis not wrong t' ta-ake th' money iv th' farmer,' says th' la-ad Finlay, an' nearly iverywan does a little farmin'. Minin' is a sa-afe gamble alongside iv placin' all ye-er bets on th' weather. Th' la-ad Munroe must have bin stung har-rd, f'r he breaks in an says, 'ye c'n trust nobody,' he says, 'not even yer best frinds,' he says, 'an' th' only way t' bate th' ga-ame is t' dale it ye-ersilf,' says he, 'an use a trained box,' he says, 'an' thin ye ca-an't be sure'.

"'Tis finally daysided that if everywan wud be honest an' obey th' Golden Rule, an' niver ma-ake a mista-ake, that condishuns wud be much improved, an' so th' resolushun is adopted, that hereafther such will be th' ca-ase. 'Tis a grate victhyry f'r th' la-ads that wanted t' let bygones be bygones."

"Well, what was all th' dayscushun for?" asked McCarthy.

"If ye raley want t' know," said Murphy, 'th dayscushun was chafely be th' la-ads that are now livin' aisy on th' dividends fr'm a few long shots they took in their arly days, an' should have bin entitled, 'How t' git away with th' contingeft fay an' kape a clear conscience'."

Cracker Creek mining district, in the northwestern part of Baker county, Oregon, is a small part of the Blue Mountain gold belt of the State, but as generally defined comprises the drainage basins of Cracker and Fruit creeks. The principal mines in this district are the North Pole, Eureka, Excelsior, Columbia, and Golconda, all situated, from northwest to southwest, in the order named, on one persistent fissure, the North Pole-Columbia vein, or 'mother lode', as it is locally designated. The aggregate production of the mines on this lode is estimated to be at least \$7,000,000. At present the Columbia is the only producing mine in the district, but the suspension of operations in most of the others is believed to be temporary and not caused by exhaustion of the orebodies. In addition to the mines above mentioned there are a number of smaller mines and prospects on which annual assessment and considerable development work is being done. J. T. Pardee, of the U. S. Geological Survey, visited the region in 1908, and says: "The results of structural studies in the Cracker Creek district indicate that the 'mother lode' is not notably displaced by transverse faults. Within the vein itself, however, there are faults which affect the orebodies. Some of the smaller veins have been offset by faulting. The fact that the faults of known attitude are normal, and that in the movement upon them the horizontal component is commonly as important as the vertical one, should be taken into account in the development of such orebodies as have been displaced."

Fushun coal is invading the Korean markets. The State railways have decided to use it, and the Kyushu coal mines are already feeling the effect of the competition.

PLACERS OF TIERRA DEL FUEGO.

Written for the MINING AND SCIENTIFIC PRESS
By S. H. LORAM.

Reading the article 'Gold Region of the Strait of Magellan', by R. A. F. Penrose, Jr., in the MINING AND SCIENTIFIC PRESS of January 23, 1909, I was struck by the difference in his general impressions from those formed by myself during a visit to the region from November 1905 to January 1906. As very little has been written on the subject, my own story may yield further enlightenment.

The southern and western portion of the region I do not know, but those interested will find useful data in 'Geological Observations in South America', by Charles Darwin. The northern and western part of the island is covered with the same formation which stretches over the greater part of eastern Argentina, the bulk of Patagonia, and large portions of southern Chile. The deposit is stratified and strikes parallel to the axis of the Cordillera, with a slight dip from the range on either side. It consists of mudstone, clay, sandstone, gravel, and limestone, with all sorts of gradations of one into the other. In color it is a pale slate-gray, weathering on the cliff faces to yellowish white. The texture is soft, as may be imagined from its composition. Though current-bedding is common, this enormous mass of material shows no bending or faulting, as far as I am aware, south of Lat. 42. Just north of this point the first fault shows up, on the extreme north end of the island of Chiloe. The southern portion shows what Darwin termed the 'boulder formation', consisting of scattered ice-carried boulders, often to be found lying on the surface, and particularly noticeable in Tierra del Fuego on the low-lying stretch of ground between San Sebastián and Useless bays. The reference of the deposit to the late Miocene by Julio Duplaquet* is, I believe, correct. His elaborate work was done in south Chile. The formation rests in places on diorite, and in others on older sedimentaries. According to Darwin, in Tierra del Fuego it lies on early Cretaceous slate. Raised beaches, formed by shore denudation in periods of comparative rest during the present elevation, are visible at several places. I noticed the three low terraces, and it is probable that the remains of as many more would be found by careful search. The total thickness of the deposit I do not know, but there is direct evidence of its being over 1000 ft. thick at Carelmarpú, Province of Llanquahué, Chile, and it may be even double this. In Tierra del Fuego the surface is rolling country, cut through by sea-worn valleys and straits, and terminating on the east coast in what is really a vertical section along that particular line, with some cliffs 50 to 60 m. high. Judging by the pebbles, the deposit was derived from the denudation of hornblende-quartz-schist, diorite, syenite, andesite, clay-slate, and some dark eurites. The first three of these are well known, as the country rocks contain gold-bearing lodes, besides carrying small

quantities of the precious metal themselves; consequently the deposits from them might be expected also to contain gold, even if in minute quantities, as in the present case. Once above sea-level, denudation started on the accumulated soft beds by wave-action; wide bays, inlets, and channels were cut, the lighter particles being carried away, while the gravel and heavier constituents, as oxide of iron, garnet, gold, and the like, remained behind in concentrated form. It must be remembered that this action came into play successively on all parts of the surface as they emerged from the sea (in other words, it has all been sea-beach once), although naturally more intensified at places that were sea-shore during the periods of comparative rest, than where the land passed through the surf-line while undergoing rapid elevation. This concentration would be increased at the same time, and continued up to date by fresh water in the form of rain and rivers on the land beyond the reach of the sea.

Especially with reference to the east coast, the Atlantic is rapidly eating away the land, and the swift north-bound current is stained muddy with sediment for as much as 200 yd. out from the shore. The prevailing wind is from the west, or 'off-shore', but there are occasional furious gales from the south-east during winter, and if one of these coincides with the high spring tide (the rise and fall of which is 40 ft.), allowing the force of the heavy sea to strike full on the base of the vertical cliffs, a whole metre of the entire coast will disappear in a few hours. The shock of the waves, even in summer, may be felt a quarter of a mile from the shore, and resembles the tremble of a slight earthquake. From actual measurement at the Páramo, at least 90 ft. of the shore had been removed during the 18 years previous to my visit. When this action is applied to a hill-side, or across the mouth of a valley, at the surface of which there has already been a first concentration, a second takes place, and in this way it appears that the richer deposits of the island have been formed. There are cases, however, where one or the other concentration alone has been sufficient to produce gold deposits of economic value. To the double process belong the beach deposits of Páramo and Cullen; to a single concentration may be referred some comparatively poor ground, accessible at low tide, at the base of the cliffs forming Nombre Head; while to the estuary-formed deposits, partly aided by fresh water, belong the inland grounds of the Rio del Oro, Rio Progreso, Rio Verde, and so forth.

It seems improbable that the Ona Indians, who inhabited the northern part of the island, knew or made use of the gold. They were a well built powerful race, who lived wandering hunting lives, existing chiefly on the guanaco, which served for food and clothing. They were entirely in the chipped-stone age; of the metals apparently they had no knowledge. According to the 'Estadística Minera de Chile', the gold was first brought to public notice by Serano Montaner, an officer in the Chilean navy, who visited the island in 1880; in the same year work was started on a tributary of the Rio del Oro, and also on the Rio Santa Maria, while some years later came the discovery of the Páramo and other east-

*'Estudio de la Zona Carbonífera de Chile', Boletín de la Inspección de Geografía y Minas. Dirección General de Obras Públicas, Chile.

coast deposits, and in '87 those of the southern islands of Lennox, Navarino, and so forth.

With regard to the east and south-coast Argentine deposits, they were first worked by Julio Popper, who seems to have been a remarkable character, combining talent, administrative ability, resource, and courage, with a want of scruple to an extraordinary degree; even when compared with the somewhat curious collection to be found among the vanguard of pioneers he was unique in his unscrupulousness. A Rumanian by birth, after a varied career in Europe, during part of which time he was in the Russian army, he went to the Argentine, and in Buenos Ayres started a company which, under his direction, began operations at the Páramo. Communication with the outside world was by schooner to Buenos Ayres, 1300 miles away; or three days journey overland through an Indian-infested country to Porvenir, and across the Strait of Magellan to Sandy Point. At the latter place Popper's imperialistic tendencies had made things even more dangerous for him than among the Indians. The miners formed a sort of half-military garrison. They received their pay in five or ten gram gold pieces made on the property, bearing the inscription 'Julio Popper. Tierra del Fuego', on one side, with the crossed picks and the weight on the other. These coins are worth today anything up to ten times their intrinsic value as curiosities. Postage stamps of similar type also were issued. A paper read by Popper before the Geographical Society of Buenos Ayres, giving a description of the island and its inhabitants, showed the work of a keen scientific observer. Popper came to a sudden end in Buenos Ayres, and it is current belief that he was poisoned in revenge by one of a party of prospectors whom he had disarmed and turned adrift from the Páramo to find their way as best they could to Sandy Point.

The beach worked at Páramo was of the double-concentration type, as already described, and from the accounts of those who were there at the time, in its virgin state it must have been wonderfully rich. The gold is found in a strip 11 km. long by about 25 m. wide, extending up the beach from a few metres above ordinary high-water mark. Usually there is a covering of quite poor sand about 50 cm. thick, under which comes a layer of 'black sand' about 5 mm. thick, which carries the gold; lower again is more sand and gravel, and then the mud-stone bedrock, usually about 1.75 m. below the surface; occasionally there are two layers of 'black sand', but the surface of the bedrock is poor in gold. The black sand is both variable and patchy in itself and its gold content. The first attempt at extraction was made by sending the rich streak by portable railway to a central works, where a small steam-plant, with pumps and other machinery, was erected. The gold being fine and laminated, was not satisfactorily saved on ordinary plates, and after several attempts the idea of central working was given up. A number of small portable plants were then constructed, to work the rich patches where they occurred on the beach. This process is in use up to date. The machines consist of a series of four corrugated amalgamated plates, about 14 in. wide by 16 in. long, placed zig-

zag one above the other at about a 35° slope. Over them is a wide shallow box-reservoir filled with water, and a small platform on which the sand is shoveled, to be sluiced through a 1/4-in. grizzly and over the plates by a small stream of water issuing from a hole in the reservoir. Another shallow box serves as a sump, from which the wash is lifted by a bucket to the upper box to serve over again; while the tailing is shoveled out from time to time. The equivalent of the lost water is brought from the sea in a barrel fitted with a spreader and pulled (rolling over and over on itself) up the beach by a horse. The outfit requires three men—one bringing water, one shoveling sand, and one lifting water from the sump. The capacity is about three cubic metres per ten hours, and although the labor is excessive, the amalgamation is remarkably good. Repeated and careful panning of the tailing shows mere traces of amalgam. The plates are not silvered, but after dressing are kept under a current of sea-water, and remain perfectly bright; although they tarnish immediately if used with fresh water, more particularly on account of the general peaty content of the ground. For shifting from one spot to another along the beach, the whole plant is mounted on a light sledge, and can be drawn by the water horse. Usually several days are spent in stripping the poor sand and collecting the rich streak into heaps, which are washed when sufficient has been accumulated.

About 18 years ago sheep-ranching was started by some farmers from the Falkland islands, and soon afterward by New Zealanders. Whether it was preference, or the fact that sheep were easier to hunt than guanaco, I do not know, but the Onas cultivated a liking for the former, which led to trouble, and the otherwise gentle shepherds drove the Indians (those that were left) from the grass-land of the North down to the southern forests and swamp, where a few still exist, being supposed to be perfectly tame. After the Indians were driven out, business prospered, and the island today supports about a million sheep, which form the main industry of the region.

On the inland raised beaches, particularly where further concentrated by streams, mining by hand-labor and washing in 'long toms' seems to have been carried on without great fluctuation by numerous small parties of hard-working Austrian miners, with fair success, compared to their modest requirements. Data as to the number of men or the output are wanting, but the 'Estadística Minera de Chile' estimates the production of the whole region during 1903 and 1904 at 137 and 170 kg. fine gold, respectively; practically the whole of which would be from small workings.

About 1900, some of the sheep ranchers had the ground examined by a New Zealand expert, with a view to investing capital, but after experiments extending over a season, the conclusion arrived at was unfavorable, and things lapsed into their usual routine until 1902-03, when the Compañía Sutphen de Lavaderos de Oro was formed in Buenos Ayres, with 750,000 Argentine pesos* capital; some 140 claims

*The Argentine peso is worth about 45 cents.

were taken up, and a small open-line bucket-dredge was purchased, which, after £30,000 expenditure and two years work, was finally ready to run on the Rio del Oro. Unfortunately, changes in administration were the cause of alterations in design. I believe that the pilot-house, originally placed on the main deck, was shifted to the roof by a second manager, and replaced in its original position by a third. Moreover, the dredge was built on the understanding that it was to handle small gravel only, such as existed on the surface, and was not provided with grizzlies or trommel. Operations showed up quite a fine collection of Darwin's boulders, of various sizes, up to those big enough to bring the digging engine from full speed to a dead stop when a bucket got underneath. In addition to this, the clay bottom was of such consistence that the buckets frequently went down as full as they came up. Under these conditions, as may be imagined, break-downs and stoppages were not infrequent. Gold was found and recovered, but when it is remembered that coal cost at least \$35 U. S. gold per ton, and that the cost of labor and other supplies was in proportion, and that the season, although variable from year to year, on an average runs from November to May, I think I am safe in stating that the precious metal was not extracted at a profit, or in quantities which would lead one to suppose that it ever would be. The capital of the company was increased and four large dredges were ordered from Holland. One was erected, and made a short run just before the end of last season. Results were stated to be satisfactory, and as the dredge began on a known favorable spot this is very likely the case. Meanwhile the 'gold fever' had spread. Land was taken up all over the island and the surrounding region; reports stating the millions of cubic metres dredgeable and the gold content (usually 1 to 3 and sometimes 5 gm. per metre, or 0.074 to 0.125 oz. per cubic yard) were issued, often when not more than two or three persons had ever visited the spot, and such as did had gone away again after a few days' stay. Further delay would probably not have improved matters, as, excepting the Austrian guides, few of the 'experts' were sure of gold when they saw it. One company, in the most accessible part of the island, began work on the basis of two bore-holes, one at either end of the property. The majority of the companies did not go to even that trouble until after the capital was subscribed and the machinery on the way. Many of the companies' shares were at a premium, some as much as 50%, before there was more than a tent on the ground; and then some of the wily promoters sold out. Another curious feature was that gold as dust and nuggets was at a premium also. The current price in the region at the time of my visit was three Chilean pesos* per gram (or \$26.13 per ounce), while its value anywhere else would only have been about 1.80 pesos. We have seen a good deal written of late with reference to gold production and expanding industry, so that some may be inclined to attribute various reasons to this particular instance, but I am personally of the impression that it was a case of supply and demand, the latter being for exhibi-

tion purposes and 'salting'. Generally the showing of dust supposed to have come from a property, and a certified list of claims somewhere, backed by the statements of an 'engineer' (who received the bulk of his pay in fully-paid shares of the company, if formed) were sufficient to find all the capital called for. The following is an incomplete list of the companies formed, with the amount of capital of each. Shares in the majority of these were at one time quoted at a premium. To this must be added a considerable amount of private capital spent both on grounds and inspection; plus those less fortunate concerns that did not get organized and quoted in time for the boom.

LIST OF PRINCIPAL COMPANIES FORMED TO WORK GOLD IN MAGEL-LAN TERRITORY, 1903-1906.

| | Capital. |
|---|------------|
| Cia. Sutphen de Lavaderos de Oro (later in- creased to | *2,000,000 |
| Cia. Dragaje Rio del Oro de Tierra del Fuego... | £35,000 |
| Cia. Dragaje Rio Verde..... | 70,000 |
| Soc. Lavaderos de Oro de Tierra del Fuego..... | †300,000 |
| Cia. Dragaje de Rio Gallego Chico..... | 35,000 |
| Cia. Dragaje de Rio Palo..... | 35,000 |
| Cia. Dragaje de Rio San Martin..... | 62,000 |
| Cia. Dragaje de América..... | 100,000 |
| Cia. Rios Unidos de Tierra del Fuego..... | 40,000 |
| Cia. Dragaje del Rio Progreso..... | 70,000 |
| Cia. Exploradora de Rio Grande..... | 40,000 |
| Soc. Explorado de Ultima Esperanza..... | 10,000 |
| Soc. Chorillos de Rio del Oro..... | 50,000 |
| Rio Oscar Dredging Co..... | *250,000 |
| Soc. Exploradora de Minas de Magallanes..... | 15,000 |
| Soc. Carmen Silva | 35,000 |
| Cia. Argentina de Exploración en Tierra del Fuego | 400,000 |
| Cia. Aurífera de Punta Delgada | †750,000 |
| Cia. Minera Rio Colorado..... | †300,000 |
| Cia. Loreto | |
| Cia. Aurífera de Lennox..... | |
| Cia. Brunswick | |
| Cia. Rosario | |

*Argentine pesos.
†Chilean pesos.

Of the above list, as far as I am aware, the only two companies carrying on active operations today are the Sutphen* and Lennox, with what results I do not know. Of the rest it is difficult to get particulars, their shares are no longer quoted on the stock lists, and even the shining brass plates that indicated their official headquarters have lost their brilliance, or have gone altogether. Three, the Rio del Oro, Rio Verde, and Rio Progreso, which were formed, floated, and managed by John D. Roberts, liquidated in June last. The first two lost all of their capital, and had some small outstanding debts. The third was more fortunate, and is now returning to its shareholders 33d. for each £1 share surrendered. According to a statement issued by the shareholders called to liquidate the company on April 25, 1908, the dredge started work on November 11, 1907, and until its final stop on March 14, 1908, had run 80 days and been stopped 44; during this time it had produced 8988 gm. gold (not stated fine or otherwise), corresponding to 112 gm. per day working time, or 72 gm. per day total time. The secretary of the company stated that he believed the capacity of the dredge to be one thousand cubic metres per day, so that the production would work out at 9.112

*The Chilean peso at that time was worth about 28 cents. *Sutphen \$10 shares are quoted at \$2 nominal.

gm. per cubic metre. The manager, Mr. Roberts (who was not present at the meeting), sent to say that he believed when once the dredge reached the actual bed of the Rio Progreso, where the dredgeable ground was much narrower, results should considerably improve. The other two companies had not even that amount of data to offer, but if their financial state was a guide to the results obtained, the recovery must have been somewhat less. John D. Roberts, the once well-driller, then dredge expert, and transitory gold king of Sandy Point, will long be remembered for his successful methods of extracting the yellow metal, even if he has not materially increased the world's supply. There are others. Beach-washing continues as it has for a number of years, being the winter resort of the Austrians who shear sheep during the summer and work with an energy worthy of better remuneration during the winter, principally sustained by the hope that a favorable storm will leave good concentrations on the beach at a depth that can be worked, and allow them to compensate by a well-earned 'good time' in Sandy Point for the long hours of standing in freezing sea-water. In summer a few men are induced to remain on the claims to keep possession, as is required by Argentine law.

At the time of my visit to the Páramo, December 1905 (midsummer), some half-dozen men at work managed to make on the average 70 pesos, Chilean money, each per month from the thin seam and black sand, which by choosing the better patches, gave from 1 to 3 gm. per cubic metre. The following is from a report made just before leaving the region in January 1906: "With reference to Tierra del Fuego as a whole, I am strongly of the opinion that if any payable properties do exist, they do not form 10% of the number in course of formation into companies; while the rest are simply 'wild-cat' schemes from start to finish." In the light of further experience I undoubtedly exaggerate. Grounds amenable to profitable work in a large economical way may exist, but proof up to date is wanting.

TECHNICAL KNOWLEDGE OF MINING.

*There is at the present time a general desire among miners to acquaint themselves with every phase of their industry, including the technical part of it, and there are numerous schools for gratifying the desire at reasonable cost. There are a thousand and one things about a coal mine which it is desirable that all coal miners should know, and which form an interesting study. In these days of explosions and accidents in mines, by which scores of miners are hurled into eternity without warning, it is important that every man who goes into the mine should know the dangers of his calling, and it affords pleasure to know that so many young men are spending their time in acquiring a technical knowledge of the danger, in addition to their practical knowledge. They thus become better able to take care of themselves, and in addition qualified for holding any position about the mine.

A coal miner who does not think and never changes

his work in the mine can work all his life at the face and know nothing about coal mining, except knocking down coal and loading it into the pit-cars. The man who has a desire to know all the details of mine operation, who has worked at every kind of employment, and who has used the text-books on mining, has generally got far ahead of the man who started at the coal face and never did anything else. The latter knows that there is such a thing as gas, and knows it has exploded and will explode again, but is not able to explain the reason. The former knows it is there, knows how it is produced and what are its chemical properties, and under what conditions it is most dangerous. He knows that a sufficient quantity of air will render it harmless, and he knows how to conduct the air to the face of the workings to carry it off. The miner who has not made a study of these things cannot conduct the air to the face. Many of them are strangers to overcasts, regulators, water-gauges, and anemometers. They may have heard of them, but so far as actual experience with them, or their uses, is concerned, they have had none. The same is true of the safety lamp. In a good many cases men have worked for years in a mine and are as ignorant as a child about its uses.

If one were to tell many of the coal miners that marsh gas in its pure state is not explosive, they would think him an ignoramus. If he told them the explosion caused by a mixture of air at, say, 5 cu. ft. of air to 1 of gas would not be as violent as it would if 8 or 10 cu. ft. of air were used, they would reason that air never exploded, and to increase its quantity in a mixture would decrease the force of the explosion. If told that the explosion would be most violent at 9½ cu. ft. of air to 1 of gas, and that it would cease to be explosive if there was present about 14 cu. ft. of air for 1 of gas, they would in all probability think the one making the statement had taken leave of his senses. If told that it would require 16 hp. to put 20,000 cu. ft. of air through an airway, but that 2 hp. had put 10,000 ft. through, they would reason that one horse could do as much work as another, and if 2 could put 10,000 cu. ft. of air through an airway, 4 ought to be able to put 20,000 through the same airway, and it would be hard to convince them to the contrary.

If told that a single pound of powder had a force that would move or propel 480 foot-tons a space of one foot in a minute, they would look at that big pile of rock, or coal, or whatever it might be, and then look at the mite of powder, and say "impossible; it can never do it."

Strength of sand-cement mortar decreases with the percentage of voids in the sand. For this reason the less perfectly sorted bank sands are to be preferred to river sand. The average tensile strength at the end of 180 days of mortar made from 8 river sands was found in the Structural Materials Testing Laboratory at Forest Park, St. Louis, to be 438 lb. The corresponding figure for 14 bank sands was 611.

Java has an important gold output. For February the Ketahoen mine produced 1950 oz. of gold and 2646 oz. of silver.

*Abstract from United Mine Workers Journal.

THE STORY OF BINGHAM CANYON.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. MACFARREN.

In 1862 Gen. P. E. Connor, in command of the Third California Infantry (volunteers) was ordered to Utah, as it was thought necessary to keep a force of Federal troops there. Johnson's army of 6000 or 8000 men that had been stationed at Camp Floyd since 1858 had been withdrawn some time previously to take part in the Civil War. Gen. Connor arrived with his troops in the Salt Lake valley in October 1862, and was met by orders from Brigham Young, head of the Mormon Church, not to cross the river Jordan. Gen. Connor answered in a characteristic Western way that "He would cross the Jordan, though all Hell yawned beneath it." And on the following day marched his troops—a handful as compared with the opposition that could have been brought against him—with fixed bayonets and loaded rifles through the streets of Salt Lake to a point overlooking the city, now known as Camp Douglas. The Third California Infantry had been recruited from patriotic miners and prospectors who were anxious to proceed to the East and take part in the great Civil War, then going on. Gen. Connor, with the idea of lessening the discontent of his men, and believing that the solution of the Mormon question lay in a large influx of people of other sects and creeds, encouraged and assisted his soldiers to prospect the surrounding country by sending them off on trips, ostensibly to look for Indians. This resulted in the discovery and slow development of mineral at several different points. By reason of this initiative and his subsequent activity in mining, Gen. Connor deserves to be styled the father of mining in Utah. It had been known in a general way that mineral existed in the country, but the Church discouraged all attempts at prospecting, believing that the energies of its people should be applied to tilling the soil, and fearing the increased strength of the Gentiles that would result from mineral discoveries.

Bingham canyon lies in the Oquirrh range of mountains, 20 miles across the valley and southwest from Salt Lake. These mountains rise precipitously with narrow canyons, from the altitude of the plain, 4000 or 5000 to an extreme height of 10,000 ft. In the early days the canyon was a wilderness, little known, and heavily forested with timber of large diameter. In 1863 a party of Gen. Connor's soldiers discovered silver-lead ore in the canyon, and on September 17, 1863, the first formal mining location made in Utah was made on a lode of silver-lead ore. In the following year placer gold was discovered, and in 1865 placer mining became active, culminating in the

years 1868 to 1872. The total yield is recorded as \$1,500,000. Bingham canyon is the only district in the State in which placer mining has been carried on to any extent. The development of the lodes was slow, because of the prohibitive cost of supplies and the opposition of the Mormons. The Central and Union Pacific railroads were completed May 10, 1869, and a branch road to Salt Lake seven months later. With the advent of the railroad and cheap supplies, lode mining began in earnest. The first earload of ore was hauled 50 miles to Uintah on the Union Pacific and shipped to Baltimore in June 1868. In 1871



The Oquirrh Mountains, Bingham, Utah.

two smelters were built for the reduction of carbonate silver-lead ore; one of these proved successful and encouraged the building of other small smelters. In 1873 the railroad entered Bingham Canyon. About 1874 the surface carbonate ore began to give out in many of the mines, necessitating a change in the methods of smelting to handle the galena. The mining of argentiferous lead ore was actively carried on until the fall in the price of silver and lead; since then it has been of minor importance.

With the passing of the placer period, attention was directed toward working the veins or deposits of gold ore. The first stamp-mill was erected in 1877; this was followed by seven or eight mills of five to twenty stamps, or with Huntingtons, built at various

times, up to 1896. Most of these mills were not operated extensively, as it was found impossible to make a close saving of the gold by amalgamation. The workings were by shallow tunnels, not exceeding a few hundred feet in depth. As depth was attained the gold content of the ore decreased, and with the appearance of sulphide ore, it was necessary to cease mining. Subsequent developments proved that they were working in the 'weathered zone' of a copper deposit, and practically all of these one-time gold mines eventually became copper producers. With a view to making a higher saving of the gold, a dry-crushing mill and cyanide plant were erected on the Highland Boy mine, but the operations were unsatisfactory because of the large amount of copper in the ore. Utter failure stared in the face Samuel Newhouse, the head of the enterprise, and his associates, until they learned that they were just passing through the surface shell into what has been and probably still is the greatest copper mine between Butte and Bisbee. In 1896 and 1897, 5000 tons of sulphide copper ore were shipped from the property. Copper mining at Bingham may be said to date from this time, for although copper ore had been shipped before, and it was known that large bodies of sulphide ore existed, its value or possibilities had not been fully realized. In 1896 the Utah Consolidated Mining Co. was organized to take over the Highland Boy and other properties. In 1899 the company put into commission a modern 250-ton smelter of roasters, reverberatories, and converters; this was soon increased to 750 tons daily capacity. The smelter was placed in the Salt Lake valley 15 miles from Bingham Canyon. Part of the remarkable success of this property has been due to the self-fluxing nature of the ore, being mainly silica, iron, and sulphur, in approximately equal proportions. The period immediately following 1896 was marked by the formation of large companies, the development of immense bodies of sulphide ore, and the erection of modern smelters of large capacity.

The sedimentary rocks of the Bingham district are quartzite, metamorphosed limestone, and some calcareous shale. These have suffered intense fissuring and intrusion, and some faulting. The orebodies are localized in the part that has undergone the greatest disturbance. The intruding rock is monzonite porphyry occurring as dikes, sills, and laccolites. The mineralization of the district is intimately connected with these intrusions. Flows of andesite have buried part of the district, but have not induced mineralization. The ore occurs: (1) as replacement deposits of copper ore in limestone; (2) as silver-lead ore with some copper and gold in fissures; and (3) as copper minerals disseminated throughout the monzonite. The ore occurring in the less soluble quartzite is lean, and in narrow bodies mainly confined to fissures. The copper content of the sulphide ore—that from the deposits in limestone—is from 2 to 5%, and of the workable monzonite porphyry $1\frac{1}{4}$ to 2%. The amount of the gold and silver additional varies, but is always an item of importance. Most of the sulphide ore is smelted directly, but that in the porphyry requires concentration on account of its low tenor. It is considered that the original magma of

the porphyry contained mineral and that the surface portion of this porphyry to a depth of some 300 feet has been further enriched by mineralizing solutions and secondary enrichment to an extent to make it commercial ore. This enriched ore appears to conform to the configuration of the surface and to extend to a fairly constant depth.

For ten years previous to 1896, E. A. Wall had been cognizant of the possibilities of these porphyry deposits and had been quietly acquiring them. In 1899 the first porphyry ore was milled, both as a commercial enterprise and as an experiment. Following this a few small mills were built and some old ones utilized to test the porphyry on a commercial scale. In 1903 the Utah Copper Co. was organized. In 1904 it put into commission in the lower part of the canyon an 800-ton concentrating mill running on porphyry ore mined by the caving system. This was the first actual demonstration that the porphyry could be made a paying proposition by operating on a large scale. Guided by the results and experience of this mill, a second and more elaborate plant was erected at Garfield, 18 miles from the mines; this plant has a capacity of 6000 tons per day, and has now been in commission two years. The ore is mined by stripping the deposit of its overburden of low-grade rock and debris, and then benching and steam-shoveling the exposed ore.

While the problem of cheap mining has been met by the use of the caving system for underground operations, and benching and steam-shoveling for surface work, and that of cheap milling by the erection of mills of immense capacity, there is still the problem of getting a high extraction. The extraction in milling the porphyry is now from 65 to 70% of the copper content; the concentration on a basis of 20 into 1. One cause for the low saving is the abnormal tendency of the sulphide to slime, another is that part of the value is in an oxidized or reduced state not amenable to concentration, and a third cause is the necessity of fine crushing to liberate the sulphide. Adjoining the 600-ton wet-roll process plant of the Utah Copper Co. is the 3000-ton stamp-mill of the Boston Consolidated Co. Near the mouth of the canyon is the 1000-ton smelter of the Yampa company. At Bingham Junction is the 1000-ton copper smelter (custom) of the U. S. S., R. & M. Co.; at Garfield is the new 2000-ton custom copper smelter of the A. S. & R. Co., both handling mainly Bingham ore and concentrate. At Lark the 3000-ton mill of the Ohio Copper Co. is nearing completion. At Pine canyon, near Tooele, the International S. & R. Co. is grading for a custom smelter that will have the ore of the Highland Boy mine as its main supply. Apparently the story of Bingham canyon as a factor in the mining industry has just begun.

Manganese steel will generally show a tensile strength between 135,000 and 140,000 lb., elongation between 30 and 40%, and an elastic limit between 60,000 and 70,000 lb. In many instances, however, steel of ordinary composition shows an elastic limit of about 75,000 lb., and in a few cases where chromium and other elements have been added, the elastic limit has been as high as 85,000 lb.

Publications Received.

Any of the books noticed in these columns are for sale by or can be procured from, the MINING AND SCIENTIFIC PRESS.

MINERAL RESOURCES OF VIRGINIA. By Thomas Leonard Watson. Published under authority of the Virginia Jamestown Exposition Commission, Lynchburg, Virginia.

This handsome volume of 650 pages was prepared to render available the scattered information upon the economic geology of the State of Virginia. The Eastern mines are less spectacular than the Western, but the mineral resources represent known deposits which furnish a basis for investment on an enormous scale. Virginia has long been one of the great producers of mineral wealth; her annual output is approximately \$20,000,000. The non-metallic minerals constitute the bulk of the production, as almost inevitably occurs in any well populated region, where the demand is heavy for clays, lime, sand, and stone; but Virginia is also a famous producer of metals. The Bertha zinc mines constitute a classic locality, where the ores follow the breccia zones of intense folding and faulting in Cambro-Ordovician limestones. From the early days iron has been smelted, and the industry has grown until there are now 26 furnaces in blast, of which 4 are making charcoal-iron, the total product being about 485,000 tons of pig-iron per annum. It is interesting to note that two electric iron furnaces are also in operation by the Willson Aluminum Co. While the iron deposits are widely scattered, the principal centres of operation at present are in Wythe and Pulaski counties, and in Roanoke and Alleghany counties, farther north. The iron deposits occur along the entire length of the Blue Ridge, and are found scattered through the more easterly counties in the Oriskany horizon chiefly, which also yields the bulk of the Alleghany ores. The mining methods employed are in some instances of great interest; in addition to the steam-shovel, hydraulic mining of hematite and limonite is practiced at the Rich Hill and other mines in Wythe county; and a simple and inexpensive method, known as 'milling' has been introduced in the New River-Cripple Creek area. The latter consists in driving a gangway into the deposit to a suitable distance, where connection is made with the surface. The shaft then constitutes a loading-bin, into which the ore is broken down in a constantly widening funnel. Caving by top-slicing is also utilized successfully on inclined deposits of the Oriskany ores, the Oriskany sandstone and overlying Devonian shale closing in above, and exposing the mine to a minimum risk of collapse. These methods are fully described and illustrated in the text of this valuable treatise. Virginia enjoys the distinction of producing the best steam coal in America. This comes from the Pocahontas, or Flat-Top field, which area embraces most of Tazewell and Buchanan counties in that State, and McDowell, Wyoming, and Mercer counties in West Virginia. The first mine was opened in 1882 at Pocahontas, in Tazewell county, thus giving its name to the entire district. The output is a 'dry' coal, containing about 20% of volatile hydrocarbons; it burns with a smokeless flame, and yet it makes a superior coke in by-product ovens. Another famous coal-area is known as Big Stone Gap, embracing Wise, Lee, and Scott counties, and extending into Kentucky. The coal mined in the State now exceeds 4,275,000 tons per year. Fully half of this is converted into coke, the remarkable yield of 68% of the original weight of the coal being obtained. The discussion of the copper deposits of Virginia is of great interest, in spite of the want of success that has attended the efforts to establish a copper industry. The ores have been erratic, rich masses being sometimes disclosed, as at the High Hill mine in the Virgilina district, in Halifax county, from which 15% ore at times has been shipped, containing in addition 8 oz. silver and a quarter of an ounce in gold. An extensive equipment was installed, but the property has failed to prove profitable. Similar want of success has attended the operations on the 'Gossan Lead', in Floyd, Carroll, and Grayson counties. The prospects are enticing, but the veins and their mineralization are unreliable. Gold mines in Virginia have also attracted attention for a century, the gross output having considerably exceeded \$3,000,000. The story of these mines is well

set forth by Mr. Watson. The interest in them is perennial, and even now a Philadelphia syndicate is investigating certain of these properties in the hope of founding a permanent gold-mining industry. Other deposits to which importance attaches are manganese, pyrite, ochre, rutile, phosphates, barite, and gypsum. The volume is one of great interest, and should attract attention to the advantages of this State, which is only in the infancy of its mineral development.

MINERAL RESOURCES OF ALASKA. REPORT OF PROGRESS OF INVESTIGATIONS IN 1908. By Alfred H. Brooks and others. U. S. Geol. Survey, Bull. 379, pp. 418, Ill. Washington, 1909.

The summary of the mining industry for 1908 shows a decline as compared with the previous year. Mr. Brooks explains this as due to the financial panic and to certain conditions that can be remedied. Lack of water owing to the drought reduced the output of placer gold nearly a million dollars. The total value of the mineral production for the year is placed at \$19,929,900, of which more than \$19,000,000 was in gold. The estimated value of the copper output was \$666,600. The value of the silver was \$74,200; coal, \$19,000; marble, gypsum, and mineral water, \$70,000. The production of lode gold increased about 22%. Mr. Brooks says that the high cost of transportation places so heavy a tax on the mining industry that it is almost impossible in most places to exploit any but the richest deposits. The paper includes a general discussion of mining conditions, costs, and methods, and the mineral land laws. The low status of coal mining in Alaska is no criterion of the future importance of this industry. Up to the present time coal has been mined for local markets only. The high-grade fuels of the Bering River and Matanuska fields are practically untouched. These fields can ship coal only when railway connection with tide-water has been established.

CONTRIBUTIONS TO ECONOMIC GEOLOGY FOR 1907. PART II. COAL AND LIGNITE. By Marius R. Campbell, Geologist in Charge, U. S. Geol. Survey. Bull. 341, pp. 444, Ill., maps. Washington, 1909.

When the series of bulletins called Contributions to Economic Geology was started in 1902 to supply promptly brief summaries of the results of Federal surveys, a single 450-page volume was sufficient to cover the field, including Alaska. The first bulletin was published within a few months after the close of the year. It soon became necessary to print separately the results of Alaskan surveys, and a few years later the data regarding coal and lignite were segregated and published by themselves. In the meantime the inclusion of illustrations added to the value of the papers, but greatly delayed publication. The great expansion of Survey work in the Western coal fields threw a heavy burden on the geologists, and the final result is the publication of this report, 18 months after the completion of the work. While the value of the reports has been increased, the benefits intended to be derived from the establishment of the series of bulletins is largely lost.

INVESTIGATIONS RELATING TO IRON AND MANGANESE IN 1908. By E. F. Burchard, E. C. Harder, and Sidney Paige. U. S. Geol. Survey, Bull. 380-E, pp. 115. Washington, 1909.

Advance chapter from Contributions to Economic Geology by the United States Geological Survey, with notes on the Clinton iron ores of the South, and the iron ores of Colorado and New Mexico, and the manganese deposits of the United States.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF MINING ENGINEERS, Vol. XXXIX. 8vo., pp. 949, Ill. New York, 1909.

This volume contains, in revised form, the papers and discussions for 1908, with the exception of a few held over for volume forty. The wide range of subjects treated and the high character of the material attest the firm position which the Institute holds in the esteem of mining engineers.

INVESTIGATIONS RELATING TO RARE METALS IN 1908. By Frank L. Hess. U. S. Geol. Survey, Bull. 380-D, pp. 40. Washington, 1909.

Illinois Mineral Output, 1908.

| | 1907. | 1908. |
|----------------------------|---------------|---------------|
| Coal | \$54,687,382 | \$49,936,159 |
| Pig Iron (estimated) | 52,229,000. | 30,135,000 |
| Petroleum | 16,432,947 | 22,648,881 |
| Clay | 13,220,489 | 11,540,056 |
| Zinc (estimated) | 6,614,608 | 5,928,792 |
| Limestone | 3,774,346 | 3,122,552 |
| Portland cement | 2,632,576 | 2,707,044 |
| Sand and gravel | 1,367,653 | 1,553,020 |
| Lime | 559,305 | 393,951 |
| Natural gas | 143,577 | 270,360 |
| Fluorspar | 141,971 | 192,179 |
| Mineral water | 91,760 | 58,904 |
| Lead ore (estimated) | 61,628 | 24,578 |
| Silica or tripoli ..... | ..... | 17,884 |
| Sandstone | 14,996 | 12,218 |
| Silver (estimated) | 1,900 | 1,356 |
| Natural and slag cement... | 174,282 | ..... |
| Pyrite | 5,700 | ..... |
| *Other products | 67,164 | 2,033,760 |
| Total | \$152,221,284 | \$130,576,694 |

*Includes in 1907: infusorial earth, metallic paint, quartz, sienna, umber, and sand lime brick. In 1908: coke and by-products, pyrite, sand-lime brick, and natural cement.

Coal in New Mexico in 1908.

The total production of coal in New Mexico in 1908 was 2,467,937 short tons, having a spot value of \$3,368,753, according to statistics collected by E. W. Parker, of the United States Geological Survey.

New Mexico did not suffer so much from the panic and business depression of 1908 as did some of the other coal-mining regions. The actual decrease was 161,022 short tons, or 6.12%. The value decreased in somewhat greater proportion—from \$3,832,128 to \$3,368,753, a decline of \$463,375, or 12.09%. The features of the year were the heavy falling off in the demand for coal by the railroads and by the manufacturing and smelting industries, and the considerable increase in the production of coke by the Stag Canyon Fuel Co. of Dawson, Colfax county. This coke is shipped to allied interests in Arizona, and displaces equivalent amounts of Eastern coke in that market.

Oliver Continuous Slime Filters.

Below follow data in regard to the operations, cost, etc., of Oliver filters at Minas del Tajo, Rosario, Sinaloa, Mexico, on a 130-ton slime plant. The equipment is: two Oliver filters of 300 sq. ft. filtering surface each, being 11 ft. 6 in. diam. by 8 ft. wide; two dry vacuum-pumps, 6 by 7 in., at 150 rev. per min.; one duplex compressor, 6 by 6 in., at 160 rev. per min., single-acting; one duplex-plunger wet vacuum-pump, 4 by 6 in., single-acting; one 2-in. centrifugal pump for charging filters; necessary shafting, and fittings for the above, as they are belt-driven; one 20-hp. 220-volt, direct-current motor which shows 55 amperes (about 16 hp.) when filters are working at the rate of 173 tons of dry slime per 24 hr., vacuum-gauge reading 24 in. (26 to 28 in. can be obtained at sea-level by using larger vacuum-pumps). The average for six months of filter-pulp is 3 oz. silver, \$1 gold per ton of slime; discharged pulp 1.2 oz. silver, 18c. gold per ton of slime; filter-pulp 1.22 sp. gr. or 2.3 tons of solution to one ton of dry slime; moisture discharged in slime, 35%; assay of solution saved, 1.3 oz. silver, 0.033 oz. gold, 0.117% KCN, and 0.03% CaO; soluble metal-values in discharged slime, 0.12 oz. silver, trace of gold, and 0.35 lb. KCN per ton of dry slime. These two filters working 18 hours per day treating 130 tons dry slime, make 15 rev. per hour. There is no increase in solution due to the wash-water. The water added is practically equal to the moisture discharged. It is found necessary to clean the cloth every two weeks with hydrochloric acid. This operation takes

from 1½ to 2 hours. It is asserted by users that the power and labor saving is an important feature; that a greater saving of KCN is made than with any other type of filter, while the operation of the filter is absolutely continuous. The costs have not been figured in detail. Before the installation of the filters it was \$1; after the installation of the filters the cost of treating the slime was reduced to 75c. per ton. The cost of operating and maintaining the filters has not been figured exactly, but will not exceed 20c. per ton of dry slime.

Commercial Paragraphs.

E. D. BULLARD, San Francisco, advises that he now has the agency for the 'Milburn Light', which is an acetylene lamp made in all sizes, from a miner's light to those used in open-air construction, around steam-shovels, dredges, and the like.

THE DENVER QUARTZ MILL & CRUSHER Co., Denver, calls attention to an error in the note published on page 36 of our issue of July 3. It was there stated that the largest mill made by that concern is 5 ft. 6 in. diam. This should have been 8 ft. diameter.

THE C. O. BARTLETT & SNOW Co., Cleveland, Ohio, has lately closed contracts with the McGillveary Coal & Coke Co., at Coleman, Alberta, and with the West Canadian Colliers Co., Bellevue, Alberta, for complete coal mine equipments, including steel tipples, power plant, and haulage systems for both companies.

The ALLIS-CHALMERS Co. announces that Edward G. De-wald, formerly manager of the water-wheel department of the Platt Iron Works, Dayton, Ohio, has joined the engineering staff of its hydraulic turbine department. He will make his headquarters at San Francisco, and will devote his special attention to the Pacific Coast business.

The SULLIVAN MACHINERY Co. has opened a branch office at Australasia Chambers, Martin Place, Sydney, New South Wales, to further the sale of its air-compressors, rock and diamond-drills, coal-cutters, in the Australasian commonwealths. Its establishment is due to the growing importance of the mining industry in that field. The new office is in charge of George R. Mair.

It will be of interest to mining men and shippers generally to know that a new line of fast and commodious vessels has been started by Jebson & Ostrander of Seattle, and is now running with the sister ships *Ella* and *Erna*, both of 3500 tons and 14 knots. These boats make regular sailings between Seattle and Corinto, Nicaragua, and intermediate ports. Two more vessels will be added soon to the fleet. The *Ella* has just been overhauled and re-equipped for first-class passenger traffic. The roomy berths have up-to-date fittings, there are fine promenade decks with free chairs, commodious bath-rooms, excellent cuisine, and the courtesy and attention of the officials will be appreciated by all who have to journey to Mexican and Central American coast ports.

Catalogues Received.

THE A. LIETZ Co., San Francisco, announces that its Solar Ephemeris for 1909 is ready for distribution. The usual data required by the surveyor in determining the true meridian by solar or stellar methods is included.

The A. S. CAMERON STEAM PUMP WORKS, New York, has prepared a little booklet for distribution at the Alaska-Yukon-Pacific Exposition. It contains interesting views of some of the buildings as well as of Cameron pumps.

The PACIFIC FOUNDRY Co., San Francisco, has just issued a catalogue on Kilker's Matte Tapping Car. It completely illustrates and describes this ingenious device for handling matte. A novel use of the car is shown, wherein the running gear is replaced by a stationary spindle and the matte launder is arranged so that either of two 'cars' may be filled. The solidified cakes are later dumped directly into a receiving car. If you have not heard of this device, send for a catalogue.

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TABLE OF CONTENTS.

| | |
|---|-------|
| EDITORIAL: | Page. |
| Notes | 133 |
| Reclamation Service Rumors..... | 134 |
| Débris From Oroville Dredges..... | 134 |
| Rejection of the Yard Mining Claims..... | 134 |
| GENERAL MINING NEWS | 137 |
| SPECIAL CORRESPONDENCE | 142 |
| CONCENTRATES | 148 |
| DISCUSSION: | |
| Comstock Bullion.....G. McM. Ross | 149 |
| The Sacramento Anti-Dredging Convention..... | |
|W. B. Winston, B. S. Noyes | 149 |
| A New Proposal for Silver..Theo. F. Van Wagenen | 151 |
| ARTICLES: | |
| Bear River District.....W. W. Rush | 152 |
| Petroleum Fields of Illinois.....H. Foster Bain | 153 |
| Fairbanks Gold Region, Alaska..... | 156 |
| Velocity of Flow of Water in Pipes..... | |
|Leonard M. Green | 157 |
| Cyanidation of Silver Ores.....Theo. P. Holt | 159 |
| Minerals in Uruguay..... | 162 |
| THE PROSPECTOR | 162 |
| MINING AND METALLURGICAL PATENTS | 164 |
| DEPARTMENTS: | |
| Personal | 136 |
| Market Reports | 136 |
| Company Reports | 163 |
| Publications Received | 163 |
| Commercial Paragraphs | 163 |
| Catalogues Received | 163 |

EDITORIAL.

THE HOUSE framed one tariff bill. The Senate framed another. The President is sitting on both and smiling. As he is a large man with much patience, the outcome is inevitable.

LISTED California oil companies paid \$558,610 in dividends in June, and have paid a total of \$24,018,741 up to July 1. This measures but a small part, however, of the local benefits of the discovery of petroleum.

CALIFORNIA produced in 1908 a total of 1,654,000 tons of gold ore, which yielded an average recovery by amalgamation of \$5.71 per ton. In addition, the concentrate produced from this ore, on a ratio of 51 into 1, amounted to 32,000 tons, which had an average value of \$50 per ton.

HEREAFTER mining claims in the National Forests are to be examined on behalf of the Forest Service at the time the survey is made, instead of after application for patent. This change removes a frequent cause of irritation, since under the old rule examination was often so delayed as to require an extra year's assessment work.

CONSERVATION will be an active theme at the Alaska-Yukon Exposition. The first National Conservation Congress will assemble there on August 26. The program as announced includes irrigation, dry farming, forestry, mining, transportation, good roads, pure food, sanitation, and the relation of capital to labor.

MINING experts are just now numerous in the Couer d'Alene region, and lengthy and learned discussions of end-lines and veins constitute the table-talk. It is said the boarding-houses have run short of knives and forks, as knives laid out on the table cloth excellently mark boundary lines, while forks seem to have been designed purposely to represent veins.

RUSSIAN laborers were brought into Nome this year by someone who modestly refuses to reveal his identity. They were met by a crowd with a brass band and used roughly, according to reports. Eventually most of them were arrested as vagrants and deported. The truth seems to be that there is not enough work to go around this season at Nome.

TELEGRAPHIC despatches still lay stress on the political excitement in Mexico. Enthusiasm ran a bit too high at Guadalajara the other day, and the rioters were given a lesson which will tend to greater self-control in future. President Diaz is wise in the method he has adopted for accustoming the people to the exercise of suffrage. Several years

ago, instead of appointing a Governor for Morelos, an election was ordered, which created a good impression throughout the country. Also the revival of the office of vice-president is comparatively recent, and this year opportunity is given for selection by ballot of an incumbent for the ensuing term. At the same time a successor to the late Governor Cañedo of Sinaloa will be chosen by the people, and a lively canvass is in progress between the rival parties, with Señores Diego Redo and José Ferrer in the field. Mexico is being given her advanced course in self-government under control of a good *maestro*. That Wall Street has faith equally in master and pupil is shown by the fact that Mexican National Railway securities, both Government guaranteed and prior lien bonds, have not moved a half-point in price within the last two weeks.

STRENUOUS efforts are now being made to attract the attention of the world to the resources of Peru. Among these is the establishment of a magazine in English, entitled *Peru Today*. The first number, just to hand, is attractive. It owes its existence to the initiative of Señor Augusto B. Leguía, President of the Republic, a man who had distinguished himself as a financier before being called to serve his country. It is interesting to find at the head of affairs one who is not essentially a politician, and to whom the post yields less emolument than he could derive from his normal pursuits. Peru is enjoying the benefit of a sane administration conducted on business principles.

Reclamation Service Rumors.

Disquieting rumors come from Washington to the effect that Mr. F. H. Newell, Director of the Reclamation Service, is to be removed. It seems that Mr. Newell allowed settlers who owned land which would be benefited by the Government works, to pay their water rates in advance by labor, using scrip instead of cash in the transaction. The Attorney-General has decided there is no warrant in law for this. There is no dispute as to it having been a sensible business arrangement, beneficial alike to the settlers and to the Government, and to remove so clean and able an official as Mr. Newell for such an offense would be widely interpreted as meaning that an excuse rather than a cause was wanted. It would confirm the ugly rumors that Mr. R. A. Ballinger, Secretary of the Interior, has started out to reverse the Roosevelt policies regarding the public lands. It need hardly be pointed out that while this interpretation would be natural, it is not necessary. It is well known that under the last administration there was much cutting of corners, or 'smashing red tape', as we all liked then to call it. Evidently Mr. Taft and Mr. Ballinger, being lawyers, are strict constructionists. If, however, this is all there is in the matter, it should be easy to stop any illegal practices and ask Congress for remedial legislation. There is no need to sacrifice an able and honest public official and arouse the suspicion that one of the cleanest public services is to be made the sport of partisan politics and possible graft.

Debris From Oroville Dredges.

Among the open letters this week we publish two communications concerning a meeting of agriculturists to discuss the effect of dredging in adding debris to the Feather and Yuba rivers. The assemblage was called at the solicitation of the mayor of Sacramento. His invitation was explained on the ground of the commercial interest of the city in the agricultural districts said to have sustained injury from dredge-tailing. That the circumstances did not warrant the action seems evident from the extreme disparity of view among those in attendance. The welfare of the agricultural community, with regard to such sources of danger, has been carefully looked after by the California Anti-Débris Association, a protective organization which commands general confidence. The executive committee of the Association has, on numerous occasions, investigated the conditions of dredging at Oroville, and certain abuses were corrected through its instrumentality. The Sacramento convention brought into relief the fact that the recent construction work upon the Western Pacific Railway had unavoidably thrown considerable amounts of material into the streams, which have occasioned temporary difficulties. Captain Thomas H. Jackson, of the Corps of Engineers, U. S. A., at the head of the work of the California Débris Commission, made the assertion that the dredges were not contributing debris to the streams, as shown from the surveys made by the Commission. That the convention realized that the question of possible damage from dredging, as now conducted, was not taken as being serious, was further evinced by the failure of those in attendance to effect a permanent organization. A committee of enquiry was appointed, but the assemblage adjourned *sine die*, so that the committee has no body to which to submit a report. The call of the mayor of Sacramento has performed a useful purpose in reassuring the public concerning the dredging industry. It has thus done much toward removing an ill-founded prejudice.

Rejection of the Yard Mining Claims.

Administration of the public lands on forest reserves develops new phases almost daily. The decision of the First Assistant Secretary of the Interior in the cases of fraudulent location of mining claims by Mr. H. H. Yard and the North California Mining Company in the Plumas National Forest, California, establishes a precedent of great moment. It marks a forward step in the development of bureaucratic functions. It is exalting administrative process to a rank parallel with the legislative. While expressing full sympathy with the Government in its necessary exertions in protection of the resources of the Nation from the grasp of monopolies, we can but regard with apprehension the exercise of authority not distinctly conferred by law.

In the case which has now arisen the Department of the Interior assumes to pass on the validity of a mining claim in advance of application for patent; it annuls the claim when the locator was not seeking to secure permanent possession, when, theoretically, he was himself holding only tentative rights. Al-

though a foreigner may not obtain patent to mineral land in the Territories, the law does not preclude his locating mining claims, which he may hold indefinitely by performing the acts required by statute. The functions of the Department in such matters are amply set forth in the Mining Law, and in advance of the determination of the character of the land, whether mineral or agricultural, no intervention of the Department is contemplated until the claimant proceeds to patent. This is a statement of the situation, quite apart from the merits of the particular case of Mr. Yard and the North California Mining Company. The flagrant abuse of the provisions of the Mining Law which had been made illustrates the need of remedial legislation. It called for Departmental interference in some manner, if a legal way could be found. Once each year, at least, the claimant or his agent is compelled to enter upon mining claims to perform assessment work in order to validate his claims. At such time the Department could obtain an injunction or restrain the claimant on the ground of trespass. This would force the issue into the courts, and not deprive the claimant of any legal rights he might have had, nor lay his claim open to prejudice from fresh locations upon the land. The decision of the Department today that one claim was fraudulently located does not prevent another claimant locating the same ground tomorrow, under affidavit of a discovery of mineral, the validity of which the Department may not call in question without investigation. Until a judicial decision has been reached, the fact of fraudulent location is not legally established, and yet adverse possession, clouding the original title, might thus be invited under the assumption that the act of the Department did restore the land to its original legal status, subject to location whenever a bona fide discovery of mineral might be made. The Departments have been setting an unfortunate example to the people, in expanding their authority in ways for which the statutory warrant seems doubtful. We have felt this to be the case in regard to the withdrawal of coal and phosphate lands from location. The success of democratic government is not to be achieved by usurping power, instead of resorting to the courts. Evidently the Government has hesitated to trust its ability to secure protection of the rights of the people by judicial process. This reveals anew the weakness of the judicial system, overloaded as it is by an absurd procedure which opens the way to placing the stamp of judicial sanction upon iniquity.

Our argument against the method pursued by the Department of the Interior has nothing to do with our opinion of the essential justice of the thing sought to be accomplished. The locations made by Mr. Yard and the North California Mining Company covered 260,000 acres of heavily timbered land in Butte and Plumas counties. Being in a mineral country, the presumption of validity of the claims could not be questioned. The mining company was first organized, and immediately thereafter, as a means for facilitating its operations, the Butte & Plumas Railway was incorporated, being ostensibly no more than a spur line into the mountains from Oroville. But it secured control of Beckwith pass, which was

desired by the Gould system for its projected trans-continental railroad, which has now been built over this route. At the same time the locations made gave the corporation, which was acting thus in the interest of the railways, an apparent control of forests of great value. While these claims lay unpatented the timber could not be touched except for actual use in the mines which might be developed in them, but the case would be different if patent should be obtained. That the persons interested ever intended to proceed to patent is open to question. This reveals another of the tortuous ways of the crafty to gain possession of National resources on favorable terms. The Department of the Interior, being supposedly unadvised of mining claims until application is made for patent, may offer timber rights on the same land for sale to the highest bidder. The bidder, by search of title, finding it clouded by mining claims, may bid at a low figure, assuming the Department cannot give unimpeachable timber rights. The mining and timber claimants will then speedily come to an agreement, and a valid right to cut and remove the timber is obtained at a greatly reduced cost. It is against such abuses that the Department is aiming, and it deserves the cordial aid of all men who have the interest of their country at heart. The region covered by the claims now rejected were shown in the hearing before the local Land Office at Susanville, California, to contain 11,000 acres containing about 160 million board feet of timber, valued at approximately \$320,000. The claims held by Mr. Yard and the North California Mining Company had in the course of nearly five years produced only about \$3 worth of gold. The development of the timber resources of the region have been retarded, as in other cases of similar character on the public lands of the West.

If the method pursued shall be sustained, a bad principle in government will have been become recognized in America. The evils of bureaucratic government are well enough known, and to our thinking the authorities at Washington would do better to utilize the courts, rather than strain after functions which are safe only in the hands of benevolent despots. Who will guarantee that the method created to protect the people may not one day be turned to strip them of right in the interest of a favored few? As a means of facilitating the administration of public lands, preventing many abuses which now exist, it would be most useful to amend the Mining Law by requiring that a locator shall perform the necessary work and make application for patent within a limited period. This would enable the Department of the Interior to legitimately take cognizance of the pretensions of claimants without impugning their rights, as apparently is done by the recent action. This method is followed in other countries, and produces a benefit to individuals and to the general public. At the same time it would appear desirable to grant to individual claimants of title to lands the right to apply for a writ of mandamus in cases where an application had been rejected. It would not be inappropriate to undertake a revision of other features of the Mining Law. It needs mending at many points.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

C. W. HAYES is in Mexico.
LOUIS PRATT is at Oroville.
W. C. MENDENHALL has gone to Hawaii.
J. P. HUTCHINS is on his way to Siberia.
S. F. EMMONS has left London for Leipsic.
JAMES A. BARE will be at Seattle next week.
GEORGE OTIS SMITH has been in San Francisco.
HORACE G. NICHOLS leaves August 5 for London.
CHARLES G. YALE has returned from New York.
F. L. BOSQUI is back from an extended visit to Europe.
C. COLCOCK JONES sailed from Seattle July 1 for Alaska.
FORBES RICKARD is in the San Juan district of Colorado.
D. W. BRUNTON has returned to Denver from southern Nevada.
E. R. PEMBROKE has made Salt Lake City his headquarters.
RICHARD PEARCE is spending the summer at Weybridge, in England.
J. H. CURLE has reached London, on his return from Cashmir and Siam.
WILLIS LAWRENCE is superintendent of the Florence mine, Goldfield, Nevada.
R. M. BAGG was in San Francisco, on his way from British Columbia to Los Angeles.
ROWLAND FEILDING returned to London from Italy, and is now on his way to Siberia.
ARTHUR WILKINSON has completed his report on Prestea Block A. mine, in West Africa.
S. J. SPEAK, of Hooper & Speak, has returned to London from West Africa, in excellent health.
R. W. BROCK is confined to the hospital at Ottawa, Canada, on account of diphtheria, but is recovering satisfactorily.
FRED G. MUDGETT has accepted a position with the National Ore Purchasing & Reduction Co., at Rawhide, Nevada.
ALLAN A. DAVIDSON is on the Gold Coast of West Africa, where he is consulting engineer to the Nanwa Gold Mines.
D. R. THOMAS has accepted the position of manager for the Predilecta Mining Co., at Guanacevi, Durango, Mexico.
E. J. CARLYLE, Kyshtimsky Zavod, Russia, was married in London June 4 to Miss C. B. Thomas, of Prescott, Arizona.

HOWARD D. McLEOD has completed a mill for the Midas Galena Mineral Co., on Lake Pend d'Oreille, and is at Sandy Point, Idaho.

C. G. PATTERSON, who has lately been in London, has gone to South Africa, in the interests of the Butters Patent Vacuum Filter Company.

FRED B. REECE, for the past two years with the Homestake Mining Co., Lead, S. D., is now one of the staff of the Socorro Mines, Mogollon, New Mexico.

AUBERT E. BRUCE has resigned his position as assistant to the manager and purchasing agent of the Ray Con. Copper Co., at Kelvin, Arizona, and has taken up his residence in Los Angeles.

HUXLEY ST. J. BROOKS has severed his connection with the Topaz Gold Mining Co., of El Mico, Nicaragua, and is now superintendent of the mill and cyanide works of the Mina Babilonia, La Libertad, Nicaragua.

F. P. GRAVES, of Doe Run, and S. DUFFIELD MITCHELL, of Carthage, have been appointed by Governor Herbert S. Hadley members of the Board of Managers of the Bureau of Geology and Mines of Missouri.

PHILIP WISEMAN, who recently resigned as manager for the Ray Con. Copper Co., at Kelvin, Arizona, is leaving on a trip to San Francisco, Seattle, and the East. His permanent address is 1003 Central building, Los Angeles.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, July 29.

| | | | |
|---------------------|------------|---------------------|----------|
| Antimony | 12-12½c | Quicksilver (flask) | 44-44.50 |
| Electrolytic Copper | 16¼-16½c | Spelter | 6½-7¼c |
| Pig Lead | 4.60-5.55c | Tin | 32-33½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|---------|----------------------|------------|----------|-----------------|
| July 23 | 13.00 | 4.31 | 5.38 | 50¾ |
| " 24 | 13.16 | 4.31 | 5.41 | 50¾ |
| " 25 | Sunday. | No market. | | |
| " 26 | 13.00 | 4.31 | 5.41 | 51 |
| " 27 | 13.00 | 4.31 | 5.43 | 50¾ |
| " 28 | 12.91 | 4.31 | 5.44 | 50¾ |
| " 29 | 12.88 | 4.31 | 5.44 | 50¾ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | July 22. | July 29. |
|-------------------|----------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird | 1 7 9 | 1 7 6 |
| El Oro | 1 5 9 | 1 5 6 |
| Esperanza | 2 17 0 | 2 16 3 |
| Dolores | 1 10 0 | 1 10 0 |
| Oroville Dredging | 0 12 0 | 0 12 6 |
| Mexico Mines | 6 7 6 | 6 8 0 |
| Tomboy | 1 1 0 | 1 1 3 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

Closing Prices.

| | July 22. | July 29. |
|----------------------------------|----------|----------|
| Amalgamated Copper | 83½ | 83¼ |
| American Smelting & Refining Co. | 94½ | 95½ |
| Boston Copper | 14½ | 15¼ |
| Butte Coalition | 24½ | 25¼ |
| Cumberland-Ely | 7½ | 7½ |
| Dolores | 6 | 6 |
| El Rayo | 2½ | 2 |
| Giroux | 9½ | 9½ |
| Greene-Cananea | 9½ | 10½ |
| Indiana Sonora | 3½ | 3 |
| La Rose | 87½ | 87½ |
| Miami Copper | 15½ | 15¼ |
| Nevada Consolidated | 23½ | 23½ |
| Newhouse | 2½ | 2 |
| Nipissing | 10½ | 10½ |
| Ohio Copper | 4½ | 4½ |
| Tennessee Copper | 87 | 88½ |
| Utah Copper | 49½ | 61 |
| Yukon | 5 | 5½ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

Closing Prices.

| | July 29. | | July 29. |
|----------------------|----------|----------------------|----------|
| Adventure | 7 | Mohawk | 62½ |
| Ailouez | 44 | North Butte | 57½ |
| Arcadian | 4 | Old Dominion | 54½ |
| Calumet & Arizona | 105 | Osceola | 135 |
| Calumet & Hecla | 655 | Parrot | 32 |
| Centennial | 32½ | Santa Fe | 2 |
| Copper Range | 82½ | Shannon | 15½ |
| Daly-West | 8 | Superior & Pittsburg | 17½ |
| Franklin | 17½ | Tamarack | 67 |
| Granby | 100 | Trinity | 13 |
| Greene-Cananea, etc. | 10½ | Utah Con. | 44 |
| Isle Royale | 26½ | Victoria | 4 |
| La Salle | 13½ | Winona | 6 |
| Mass. | 8½ | Wolverine | 150 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, July 29.

| | | | |
|----------------------|-------|-----------------------|------|
| Atlanta | \$ 10 | Mayflower | \$ 9 |
| Belmont | 87 | Midway | 20 |
| Booth | 10 | Montana Tonopah | 75 |
| Columbia Mtn | 8 | Nevada Hills | 80 |
| Combination Fraction | 65 | Ophir (Comstock) | 1.20 |
| Daley | 21 | Pittsburg Silver Peak | 46 |
| Fairview Eagle | 18 | Rawhide Coalition | 24 |
| Florence | 2.92 | Rawhide Queen | 34 |
| Goldfield Con | 6.85 | Round Mountain | 71 |
| Gold Keweenaw | 9 | Sandstorm | 8 |
| Great Bend | 6 | Silver Pick | 10 |
| Jim Butler | 9 | St. Ives | 5 |
| Jumbo Extension | 16 | Tonopah Extension | 48 |
| Llanos Con | 75 | Tonopah of Nevada | 6.95 |
| MacNamara | 23 | West End | 23 |

General Mining News.

ALASKA.

KETCHIKAN DISTRICT.

(Special Correspondence).—The It mine is shipping 800 tons of copper-gold ore per month which nets \$20 per ton. There are 200,000 tons of ore blocked out in the mine.—A gravity tram and railroad have been constructed from the Goodroe mine to the harbor at Karta bay. The ore is bornite and chalcopryite carrying from \$2 to \$3 gold per ton on a limestone contact.—The latest discovery in this district is a 3-ft. vein of galena that can be traced for 1000 ft. on the surface. There is some silver associated with the lead.—M. D. Ickes and W. L. Polson are developing a vein of lead-copper-gold ore at Mallard bay. A cross-cut at a depth of 35 ft. cut a 7-ft. vein of good shipping ore.—The Victor Copper Mining Co., operating 12 miles southeast of Ketchikan are driving an 1100-ft. cross-cut adit which is in now 600 ft. Three veins have been intersected. Patrick Heany is in charge of the work.

Ketchikan, July 9.

ARIZONA.

COCHISE COUNTY.

The orebody in which the shaft of the Empire Gold-Copper Mining Co., near Dragoon, is being sunk has widened till at a depth of 80 ft. the bottom is entirely in ore. Seth Merrill is manager.—At the Centurian occasional shipments are being made, but the work is mainly confined to blocking out the ore. A new gasoline hoist has been ordered and will be at the mine in a short time.—At the Copper Chief a heavier hoist is to be installed and the shaft is being re-timbered for a new skip. Frank McGovern is in charge of the work.—The Telfair shaft of the Arizona-Michigan near Johnson is down over 500 ft. in diorite and has cut a small amount of vein matter. A heavier hoist is to be installed and cross-cuts started from the 600-ft. level. Nels A. Nelson is manager.—The Arizona United Mines Co. is opening a body of ore on its Chicora claim that assays 15% copper.—The grading for the smelter at Johnson has been completed and the concrete foundations are being constructed. A gang of carpenters are working on the ore-bins, and many of the smaller mines of the neighborhood are piling their ore on the dumps in anticipation of the blowing in of the furnaces.—The 475-ft. adit on the Virtue property near Paradise cut a vein of 3% copper ore at a point giving 230 ft. of backs.—On the Missouri claim of John A. Duncan samples taken from the lime-porphry contact assayed 20% copper.

GILA COUNTY.

Samples from the vein on the property of George A. Feagles in the Tonto district assayed \$15 gold per ton. The vein is 10 ft. wide and has been sampled the length of the claim.

MARICOPA COUNTY.

The Bisbee Coalition Co. has purchased the properties of the Eureka Mining Co. two miles north of Bisbee for \$200,000. The company will sink to the 200-ft. level and cross-cut from that point.

MOHAVE COUNTY.

Barney McCall has disposed of his interests in the Weaver district to N. C. Pettit and E. B. Van Deman.—The Carter Gold Mines Co. has installed a compressor and is now sinking the shaft with power-drills.—The Union Basin Mining Co. shipped 12 cars of ore from the Golconda mine to the Oklahoma smelters.—James Uncapher is opening a turquoise mine in the Mineral Park district.

PINAL COUNTY.

At a directors' meeting of the Ray Consolidated Copper Co. it was decided to build a mill with a capacity of 5000 tons per day, instead of 3000 as previously planned, and the stockholders will be called to vote upon the issuing of 200,000 shares of stock to raise the money to cover this extra expense.

YAVAPAI COUNTY.

The Business Men's Association of Mayer has taken over

the Rigby reduction plant and will convert a portion of it into a lead smelter. The ores of this district contain considerable lead, which has previously been allowed to go to waste.—The mill of the Independence and Union Hill mines has been repaired and a 10-ton tailing plant installed for the treatment of the accumulated tailing. John S. Jones is manager.—Alex. J. Lyons and E. J. Jordan have taken over the Lulu & Lone Pine property in the Jerome district. Several adits have been driven and a winze sunk that opened some high-grade sulphide ore.—The shaft of the Haynes Copper Co. is down 700 ft., a station cut at the point, and a cross-cut started to the west. The cores from the diamond-drill showed a good copper content at this level.

YUMA COUNTY.

W. G. Read is developing a good prospect on his claims in the Winchester district. Samples taken from several veins cut by the adit assay \$40 gold per ton, with small amounts of lead, copper, and silver.—The Ben Hur group near Vicksburg is held under a \$15,000 bond by J. D. Mitchell and A. Matthews. The property is near the railroad and the owners have a carload of ore on the dump for a trial shipment.—The Planet group at Planet has been purchased by the Lewisohn interests from A. B. Jones.—The Rogers brothers have sold the Brooklyn group of 18 claims to a Los Angeles syndicate.

CALIFORNIA.

INYO COUNTY.

The Keeler smelter shipped 270 tons of lead bullion to the Selby plant during the past week.—From the Cerro Gordo mine 100 tons of \$100 ore were sent over the tramway to Keeler.—A 5-ft. vein has been opened in the Skidoo mine, 14 miles west of Death Valley in the Tucki mountains, that assays \$20 per ton. The five stamps recently added to the mill are dropping on good ore and the monthly clean-up will approximate \$30,000. Matt Hoveck is manager.—E. A. Montgomery, the principal owner of the Cocopah mine, adjoining the Skidoo property, is authority for the statement that a 20-ton mill and cyanide plant will be constructed for the treatment of the company's ore.—The return on a carload of ore shipped from the Shieve & Utank lease in the old Chedago district to the Mammoth smelter at Kennett was \$30 per ton. There are several carloads of similar ore on the dump, and as it is silicious it makes an excellent flux for the Kennett ores.—The Birch creek placers west of Big Pine are now in operation and are washing a 25-ft. bank that averages more than \$20 per cubic yard. C. A. Curl is directing the work.—The Tecopa Consolidated Mines Co. has purchased the equipment and is laying 13 miles of track from Tecopa to the Tecopa mines. The ore is of the lead-silver type and the company has enough blocked out to warrant the spending of \$200,000 to equip a railroad to the mine.

MONO COUNTY.

(Special Correspondence).—The United Gold Corporation has purchased the Sunny Jim group and the Tyler holdings. The company is negotiating for other properties in this district, and expects to commence production on a large scale within a few months. The recently acquired properties are situated a few miles north of the Pittsburg-Liberty group.—The Pittsburg-Liberty is shipping ore running \$200 to \$600 per ton to the smelter, and treating considerable low-grade material at its mill.

Masonic, July 20.

PLACER COUNTY.

J. Pierson, of Colfax, is mining an exceptionally rich bar on the American river, portions of which have run as high as \$1 per pan.—The McGeachin Mining Co., of Sacramento, has purchased the Morning Star mine at Iowa Hill. The property is chiefly valuable for the water-rights owned by the estate.—The Peckham Hill mine is to be re-opened shortly. Earl Tiffnay is the owner.—The El Dorado & Placer Dredging Co. is to build a new dredge at the Cash Rock placer claims. The dredge will be a combination of the suction and bucket types.

PLUMAS COUNTY.

J. Riley has bonded the George Scott quartz mine near

Quincy. The ore is free-milling and some rich pockets have been taken out by the former operators.

SACRAMENTO COUNTY.

The result of the Anti-Dredging Convention was the appointment of a committee of six to investigate the action of the gold-dredges, their effect on the rivers, and the destruction of farming land, and to report such information to the Anti-Débris Association and the California Débris Commission.

SAN BERNARDINO COUNTY.

James H. Hart is running a drift on a 1-ft. vein in the Oro Belle No. 2 that assays more than \$100 per ton.—A raise from the main adit of the Oro lease of the Big Chief Mining Co. cut an ore-shoot that assays \$6000 per ton.—The Oro Belle shaft is down 300 ft. and a station is being cut at that point. The shaft will be sunk another 100 ft. in hopes of striking a sufficient flow of water to supply the mill the company plans to erect on the property.—O. F. Bevere has purchased a one-third interest in the Rambler claim adjoining the Jumbo property.

SHASTA COUNTY.

S. C. Denson, of San Francisco, purchased the Syble mine near French Gulch at auction for \$10,000 in behalf of Charles O. Rose, trustee for the bondholders. The mine was bonded several years ago for \$50,000 and the interest now amounts to \$18,000. No action has been taken as to the future of the mine.—The Bella Vista Oil Co. has been organized at Bella Vista to prospect for oil in that vicinity.—The cross-cut adit on the Yankee John property west of Redding has opened a vein of ore that assays between \$300 and \$500 per ton.—The second furnace of the Balaklala company at Coram has been blown in.

SIERRA COUNTY.

The lower adit at the Tightner mine has broken into the serpentine and is expected to cut the vein at any time. This will give 600 ft. of backs on the Tightner vein.—At the El Dorado the 10-stamp mill is running on a lot of rich ore that was taken out several weeks ago.—Arrangements have been made for the resumption of work at the Sixteen-to-One mine.—The Gibraltar shaft has been unwatered and is being sunk to bedrock.—The main drift on the Gray Eagle opened a shoot of rich ore.—The drift on the lowest level of the Alaska mine has opened an ore-shoot of high-grade rock. This shoot is presumed to be one worked in former days at the mine, which was 1800 ft. long in the upper levels, and excellent milling ore. The present working is 100 ft. below the old works and 650 ft. below the outcrop. George St. John is manager.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Linn Consolidated Mining & Milling Co.'s 50-ton mill is running night and day on a lead-zinc ore, and the net earnings average from \$3500 to \$4000 per month, after deducting mining expenses. A body of medium-grade ore is being followed that is from 5 to 7 ft. wide, the average value being from \$16 to \$18 per ton in silver, lead, and zinc. C. E. Pughe is manager.—A rich find has just been made on the Columbia property situated on Silver mountain. The discovery was made in carrying a stope from the lower adit, the streak being 6 in. wide and assaying 4 oz. gold per ton and 10% copper. The stope is 90 ft. long, with ore the entire length. E. J. Butts, the manager, states that work on a new adit to gain depth will be put under way in a few days, and a compressor and machine-drills will be installed at an early date.—A. D. Bryant, of Silver Plume, has uncovered a 4-in. streak of 400-oz. silver ore on the Seven-Thirty mine, on Sherman mountain. The ground has been opened for 15 ft., with the streak showing the entire length. This ore was found directly under the workings where a production of more than \$100,000 was made a few years ago.—Work on the new adit at the Josephine mine on Kelso mountain is progressing satisfactorily, following a streak of galena that is from 6 to 10 in. wide. J. R. Sapp, the manager, states that a compressor plant will be installed soon.—C. V. Cooper has been appointed manager of the Waldorf Metals Co.,

operating a large amount of ground through the Wilcox adit under lease. Heavy shipments are being sent out over the Argentine Central railroad, from 200 to 250 tons of ore being marketed weekly.—Work has been resumed upon the Walsh group of claims in West Argentine. This property was recently purchased by E. F. Clark, of Minneapolis, and a company is in process of organization. In the shaft that is being sunk on the Walsh vein a streak of heavy lead ore is showing that is from 9 to 17 in. wide and assay tests show the lead content to be 60%, with 45 to 60 oz. in silver per ton.—The Paragon adit on Sherman mountain is being driven steadily forward, two veins having been intersected. The last one passed is heavily mineralized, and as soon as the heading has been advanced for 50 ft., driving will be started east and west on the Walsh vein for the exploitation of the ground. W. F. Cogswell is manager.—A force of men was sent this week to the DeVotie group of claims, situated in the Daily district. The cross-cut is to be driven ahead for the intersecting of the series of veins. Driving is also to be started on the DeVotie vein, as a streak of ore is showing that is from 7 to 10 in. wide. Shipments have brought as high as \$200 per ton in gold and silver.

Georgetown, July 21.

CHAFFEE COUNTY.

After experiencing considerable preliminary difficulty the Kuenzel smelter at Buena Vista has been successfully blown in. The smelter uses oil for fuel and has a smoke-consuming device that is said to give excellent results. Charles A. Kuenzel, the inventor, is preparing to build a number of such plants to work the dumps that are too low grade to ship or mill.

GILPIN COUNTY.

R. S. McConnel and W. McLeod have secured a lease and bond on the London mine in the Twelve Mile district. Sample shipments to the Black Hawk sampling works assayed between \$80 and \$90 per ton.—The Golden Rod mine in Silver creek is being re-opened.—The Fagrellius & Johnson property in Moon gulch has been bonded to Idaho Springs capitalists, who are to erect a mill on the property. A large amount of low-grade ore has been blocked out in the mine.

EL PASO COUNTY.

The plans for a new mill at the Portland Mining Co.'s property at Colorado Springs have been completed and the contracts for the construction awarded. During the building of the mill the quarterly dividends will be reduced 2c. per share. George M. Taylor is superintendent.

LAKE COUNTY.

Operations have been resumed on the Dinero adit at Sugar Loaf mountain. Dudley M. Gray is manager.—The Gold Bug adit has cut a number of small veins from which favorable assays have been obtained.—The Horri-gan brothers are developing the recent find on the Highland Mary claim on Breece hill. The shaft has been in ore of milling grade for the last 25 ft.—Heavier track is to be laid from the Yak tunnel to the Tribune lease on Breece hill and new machinery installed. The ore recently opened on the lease is still of shipping grade. L. R. Johnson is manager.

LA PLATA COUNTY.

A rich discovery has been made on the Old Comfort claim in Root gulch one mile from the Comstock mine. Assays from a 16-in. vein run over \$600 per ton, and float has been found on the property that assayed \$2000. T. J. Crowdis, superintendent of the Tomahawk mine, has purchased a quarter interest in the claim.

SAN JUAN COUNTY.

A shipment of two carloads of high-grade ore was forwarded from the Frank Hough mine to the Durango smelter.—The mill of the International Mining Co., operating the Iron Mask mine, is nearly complete and will be started within the next two weeks. V. H. Yarnall is manager.—J. B. Ross and S. S. Watson have secured a bond on the Little Maud mine in Maggie gulch. Considerable money has been spent in development work and some high-grade ore shipped by former operators.

TELLER COUNTY.

The Zenobia mine on Bull hill is being re-opened by the Zenobia Gold Mining Co., a corporation controlled by Stratton's Cripple Creek Mining & Development Co.—The Clements Leasing Co. has taken over the Gold Sovereign mine and is erecting a new surface plant to replace the one destroyed a short time ago by fire. A 25-ton shipment was made by lessees from the new management.—The La Bella Investment Co. has secured a prospecting permit from the Hart Gold Mining & Leasing Co. on the Jessie G., Fresno, Brooklyn, and Hart claims on the north slope of Bull hill. These claims have not been worked for several years, but in the past a number of high-grade shipments have been made from the property.—The Wild Horse mill has been re-modeled and the stamps are now dropping on ore mined by lessees on that property.—David Mason and John Larson, of Victor, have secured a lease on the Mountain Beauty property above the 550-ft. level.—Three tons of \$100 ore was shipped by the Little Puck Mining Co. from the Climax No. 2 claim on Squaw mountain.—The average return on two shipments of eight tons from the property of the Colorado Mines Investment Co. was \$140 per ton.—The Western Investment Co. shipped a trial lot of its ore from the 650-ft. level of the Rose Nichol mine on Battle mountain.—M. B. Rapp, of Cripple Creek, has secured a 12 months lease on Block 2 in the Dolly Varden mine on Raven hill.—The cross-cut from the 1000-ft. level of the Cresson mine opened a vein that is between 12 and 20 ft. wide. Drifts have been started along and stoping will commence at once. The Cresson company has secured an option on the Moose and Requa properties. Richard Roelofs is superintendent.—A contract has been let to sink the main shaft of the Pinto mine from the 650 to the 750-ft. level.—R. G. Harrison recently shipped the first lot of ore from the Happy Year mine that has been sent out since the mine was shut down several years ago. It is estimated the ore will average \$15 per ton.—The Portland Gold Mining Co. of Victor has commenced grading for the foundations of its new mill between No. 2 and 3 shafts on Battle mountain. Frank M. Kurie is manager.—The Vindicator Consolidated Gold Mining Co. has made another rich discovery. The drifts from the 1400-ft. level opened a 6-ft. vein of smelting ore that assays \$50 per ton. E. J. Trevarrow is superintendent.—Johnson & Hastain shipped four cars of ore for which the average return was \$70 per ton.—The Eclipse No. 1 claim has been purchased by the Jo Dandy Mining Co. from the New Haven Gold Mining Co. J. M. Wright is manager.

IDAHO.

BLAINE COUNTY.

A saw-mill having a capacity of 10,000 ft. per day is being erected on the property of the El Oro Mining Co. on Bear creek, 30 miles northwest of Soldier. The machinery for a mill and hydro-electric plant is being forwarded to the mine, and when these have been completed a cyanide plant will be installed. Joseph Mornington is in charge of the work at the mine.—At the Flick placer mine several miles of ditches have been constructed and new hydraulic equipment installed.—A 25-ton mill and 65-hp. electric motor have been installed at the property of the Bear Creek Mining & Milling Company.

IDAHO COUNTY.

A 4-ft. ore-shoot has been opened by R. L. Wilson on the Wander claim in the Four Mile district.—On the Buckhorn property the 75-ft. adit has opened a 20-ft. vein of milling ore.—The saw-mill built to furnish the lumber for the Elk City and Jennings Dredging companies is now running. A carload of machinery has been shipped for the Jennings dredge and the rest of the equipment will be forwarded shortly. R. H. Bond is in charge of the construction.—J. J. Jacobs, of Marquette, has bonded the Franklin, Comet, and the Gold Brick groups of 23 claims.

KOOTENAI COUNTY.

By over-ruling the Land Office the Department of the Interior has awarded the Yankee mill-site on Big creek in the Coeur d'Alene district to True and Dennis Blake. The Land Office held for cancellation the application of the

Blakes for the mill-site. In reversing the decision, the Commissioner says: "It appears that the mining claims cover a continuing vein or lode, and it is averred by the appellants, and nothing otherwise is disclosed to contradict it, not only that the group is a producing mine from which ore is at present shipped, but that for four or five years past the mill-site has actually been used for mining and milling purposes in connection with the group of claims."

OWYHEE COUNTY.

At a stockholders' meeting of the Potosi Mining Co. a bond issued was voted to raise \$250,000. Eastern capitalists have made arrangements to take the bonds, which are to run for a period of 10 years.—An air-compressor and electric plant have been installed at the Rich Gulch mine near Silver City.

SHOSHONE COUNTY.

A. J. Brainard, manager for the Samson Mining & Development Co., reports a discovery of high-grade galena and carbonate ore in the Bunker-Chance adit on Eagle creek, 5½ miles from Murray. The ore was cut on the foot-wall at a depth of 200 ft. in the lower adit, and a drift on the ore-shoot 50 ft. back from the present find opened a body of concentrating ore 40 ft. wide.—Eight feet of high-grade milling ore was cut on the Black Bear Fraction near Gem. A 2000-ft. cross-cut was driven to intersect the vein, which has since been driven upon for 1000 ft., the face at this time having an approximate depth of 1300 feet.

MICHIGAN.

The Wyandot Copper Co. has cut another vein in the cross-cut west on the third level. The vein is very hard, except for 18 in. on the foot-wall, which was unusually soft, and well impregnated with copper. Two cuts have been taken, but the hanging wall has not been disclosed.—Not more than 18 or 20 men are now employed by the Keweenaw Copper Co. in its mining and exploratory operations. Only a few drills are running underground, and the greatest interest at present lies in the diamond-drill work, which is prospecting for the Kearsarge vein. This was discovered by diamond-drilling several years ago, and the present effort is to determine its extension and dip, and to select the most advantageous place for sinking a shaft.—The special stockholders' meeting of the Aztec Copper Co. has been postponed until August 9. The purpose of this meeting is to increase the capital from 40,000 to 100,000 shares. After this is done it is expected that a portion of the new stock will be offered for sale, thereby providing money with which diamond-drilling will be started as quickly as possible.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—Two good discoveries are reported from the Center Creek land at Webb City. Two runs of ore were opened, a shallow run which was quite rich, and a deeper one more extensive and requiring a mill for treatment. Eleven drill-holes have been sunk north of Oronogo on the Poundstone farm, all entering good lead and zinc-blende.—Two good finds have been made in the vicinity of Carthage, one on the Ben Mevey land near the Tri-City Mining Co., the other on the I. C. Hodson farm, where a 24-ft. face of mineral was found at 212 ft.—The McKinley mill at Prosperity is closed down temporarily for re-modeling and enlarging.—The old Acorn tract at Prosperity, which has been idle since the burning of the mill some time ago, is to be re-opened by a new company. The ore here is rich and a large body is known to exist, there being a working face of about 1000 ft. A 200-ton mill will at once be erected, and perhaps a second one of like capacity if conditions warrant it.—The old Hockaday mill at Oronogo is being re-modeled for a tailing plant. The ore here was disseminated and difficult of separating, and hence a large percentage was lost in the milling.—The Kittle Mack Co., west of Joplin, is building a 250-ton mill which will be completed in another month. This company has sunk a shaft to the ore, which is of the disseminated sheet type found in that locality.—In the Paragon mine adjoining, the company is taking up a 10-ft. stope in the

old drifts.—A new shaft is being sunk at the Mandarin mine west of the Chicago-Joplin and a new orebody opened, so that sufficient ore can be furnished to keep the plant running steadily.—The Chicago-Joplin is operating from two shafts and is putting down a third on a drill-hole that cut the ore from 70 to 110 ft. The same company is running the Myrick mill to the east on a similar ore.

Joplin, July 24.

NEWTON COUNTY.

The Spring City camp is being materially extended southward by Adam Scott, who is prospecting a tract where zinc-blende is found in good quantities, whereas the main ore supply from this camp is galena and silicate.—A shaft on the Paul land cut an ore termed 'steel-jack' from 50 to 90 ft.—The Sunrise mill, which was destroyed by fire, is now replaced and ready for production.—Fairchild and Armil are installing pumps in an old shaft on the Armil land, where silicate and galena of good grade are known to occur at 101 ft.—The Granby M. & S. Co. has put three drill-rigs to work upon 1400 acres west of the camp.

Spring City, July 22.

MONTANA.

JEFFERSON COUNTY.

A new discovery is reported on the Boston & Corbin property at Corbin. The orebody is said to be 7 ft. wide and to contain 2 ft. of high-grade ore, the other 5 ft. being a good concentrating ore. There is much enthusiasm in Corbin over the strike.

NEVADA.

CHURCHILL COUNTY.

The Nevada Hills Mining Co. and the Nevada Wonder Mining Co. at Wonder are considering plans for the joint installation of an electric-power plant at Fallon. The Nevada Hills company is to let contracts for the construction of a 20-stamp mill shortly and sinking the shaft another 100 ft. On the 200-ft. level a large quantity of ore is blocked out on a 7-ft. vein, and two or three cars of \$100 ore is being shipped per day. W. H. Webber is manager.

CLARK COUNTY.

George Wingfield and F. J. Siebert have given up their bond on the Sproul & McLaughlin property at Fredelen, the length of their bond not having given sufficient time to prove the merit of the property.

HUMBOLDT COUNTY.

The National Mining Co. at National has opened a vein of high-grade ore and is sacking it for shipment. The adit cut the vein at a point 300 ft. below any previous workings. S. W. Gundaker is in charge of the work.

LANDER COUNTY.

(Special Correspondence).—The new 60-hp. hoist is being installed at the Frost shaft of the Austin Manhattan properties.—The drift on the 140-ft. level of the Hardy has cut a 5-ft. vein of milling ore.—The Maricopa Mines Co. is installing its steam hoisting and pumping plant at its lease on the Parrot.

Austin, July 22.

NYE COUNTY.

(Special Correspondence).—The Gold Bug Mining & Tunnel Co. has cut carbonate of copper in the Golden Gate claim at a depth of 50 ft.—Swelling of the shaft at the 400-ft. level of the Belmont crushed the 8 by 8 in. timbers last week and forced a suspension of work for several days. New timbers have been installed and the mine is again working full-handed.—The recent shipment of ore from the Clifford-Nay properties at Elendale approximated \$4000 per ton. The Pierson-Goodhue-Callahan-Hill lease report having opened a vein of \$200 ore at a depth of 25 ft. At a depth of 50 ft. a cross-cut will be driven. This lies near the Clifford holdings.—There are a large number of people in the camp, but it is evident that little work will be performed until the original locators demonstrate their confidence by sinking to fair depth.—The Fairview mine at Round Mountain is producing a fair quantity of milling ore. The vein is 4 to 6 ft. wide in the main adit.—The Morgan shaft at the Daisy is down 200 ft. A drift 105 ft.

long has been pushed from the lower level. It is intended to mine the ore by the glory-hole method.

Rhyolite, July 23.

The property of the Millett Mining Co. east of Millett is being re-opened. A. B. Millett and Paul Manuel, the principal owners, have assumed the management of the mine and mill and will have both running in a short time. Smelting returns from surface shipments have been from \$300 to \$400 per ton, and a lower adit is expected to open ore of similar value.—Several shipments from the Manuel Mining Co.'s property have been settled for on the basis of \$200 per ton by the Salt Lake smelter.—The Jingle-Clothier lease on the Tramps Consolidated property in the Bullfrog district has a 20-ton lot of high-grade ore ready for shipment. The vein is from 6 to 10 in. wide and averages \$100 per ton. The Hobo lease is working on a 10-in. vein, the pay-streak of which assays \$2400 per ton. The ore carries a large amount of manganese. The Kuliachi-Vucovich lease shipped a car of ore to the smelter at Needles that assayed \$90 per ton.

OREGON.

BAKER COUNTY.

A decree was entered in the Circuit Court at Baker City against the Oregon Smelting & Refining Co. for \$42,592. The smelter will be sold at a sheriff's sale.—The Golden Chariot mine near Sumpter is being unwatered.—The face of the drift on the Mountain View Extension property is in good ore. Frank Johnson is in charge of the work.

GRANT COUNTY.

The vein in the drift on the No. 4 vein of the Gold Bug property has widened to 3 ft., and is cutting a fair grade of milling ore. R. B. Wallace is manager.—The Kennerly Gold Mining Co. has been organized to operate the Ophir mine in the Susanville district. Considerable ore has been blocked out and the mill will be enlarged to handle the increased output from the mine. T. S. Kennerly is manager.—An excellent showing has been made on the Excelsior property on Red Boy mountain. John Smith, of Baker City, is the owner.

JOSEPHINE COUNTY.

The President has just signed a proclamation making a National Monument of the Oregon Caves or 'Marble Halls' of Josephine county, which are situated about 30 miles south of Grant's Pass. These caves were discovered in 1874 by Elija Davidson, and explored by F. M. Nickerson, of Kerby, in 1877. Five miles of openings are known to exist on the mountain and several levels have been opened. The Forest Service has re-built and improved the trails leading to the Caves, to make them more accessible.—The diamond-drill equipment for the National Copper Co. has arrived at Grant's Pass and will be hauled to the mine at once. The drill is capable of drilling 400 ft. and is operated by a gasoline engine.

UTAH.

BEAVER COUNTY.

The old Rebel mine in the Star district is being re-opened after having been idle nearly 30 years. Mat Cullen, who operated the property in early days, has taken it over and is equipping it with a complete power-plant.—Water has been struck on the 500-ft. level of the Harrington-Hickey mine, operated by the Majestic Mining Co. A new pumping plant has been ordered and sinking will be resumed. The company's smelter is operating successfully on ore from the mine.—The Moscow is shipping regularly to the Salt Lake smelter.—The adit on the Nellie group is opening a vein of copper ore that is rich in manganese.

JUAB COUNTY.

Good ore is being opened on the first, second, and third levels of the Uncle Sam mine in the Tintic district. C. C. Griggs is superintendent.—The entire Tintic smelter has been closed down for a short time to install a new concentrator and other machinery and to overhaul the plant. The ore will be shipped to the valley smelters, so the output from the Knight mines will not be curtailed.—The Scranton mine in North Tintic joined the ranks of shipping properties last week. The ore shipped from the Tintic

district amounted to 7640 tons for the week.—The shaft at the Zuma mine is down 235 ft. in a limestone formation. The company expects to cut the ore on a lime-porphry contact.—At the Eureka Hill mine at Eureka the development work is confined to the 400 and 800-ft. levels.—The Canyon Siding Mining Co. is sinking a two-compartment shaft to the 200-ft. level, from which point it will cross-cut to the vein.—Preparations are being made to commence shipping from the Eagle & Blue Bell mine.—A contract has been let to sink the shaft on the Gray Rock mine to the 150-ft. level.—A gasoline hoist has been installed at the Gold Blossom mine in North Tintic, and a compressor plant will be built shortly.—A break in some of the gearing at the Taylor & Brunton sampler at Silver City closed the plant for a few days. David Taylor, the manager, stated that the plant was handling from 700 to 800 tons of ore per day.—The output from the Grand Central and Victoria mines amounts to 9 carloads per week. Grant Simonds is manager.—The Gemini Mining Co. shipped two carloads of ore to the Salt Lake smelter. C. B. Marshall is superintendent.

SALT LAKE COUNTY.

Recent shipments from the Utah-Apex mine have been settled for on the basis of \$22 per ton. The raise from the Parvenu adit to the Andy incline will be completed about September 1 a distance of 350 ft. The smelting ore will then be shipped over the Boston Consolidated spur to the smelter and the milling ore to the Phoenix mill.

SUMMIT COUNTY.

The winze from the 260-ft. level of the Uinta Treasure Hill near Park City is being sunk on a 6-in. vein that assays 39% lead, 12 oz. silver, and \$2 gold per ton.—The Silver King Consolidated Mining Co. at Park City cut a body of lead-silver ore that assays 50% lead and 400 oz. silver at a point that gives the company 1600 ft. of backs.

TOOELE COUNTY.

The old Geyser Marion mill at Mercur was completely destroyed by fire last week. The mill had been idle for 10 years, but contained much valuable machinery. Some time ago an attempt was made to re-open the mine under the name of the New Mercur property. W. S. McCormick, of Salt Lake, and H. Otto Hanke are the heaviest losers.—M. E. King, manager for the Silver Island Mining Co., brought several sacks of silver ore from the Silver Island mine in the western part of the county to Salt Lake to be assayed, all of which ran over 200 oz. silver per ton. The ore was taken from the lower drift on the Haphazard vein, from the surface workings of which \$10,000 worth of ore was taken last winter.

CANADA.

BRITISH COLUMBIA.

The increased output of the mines in the Trail district has compelled the Consolidated Mining & Smelting Co. to blow in the fourth copper unit at the Trail smelter. This makes four furnaces handling copper and one lead ore, the combined capacity being 2000 tons per day. A record of 250 tons of lead bullion per day was made a short time ago. The capacity of the lead refinery has recently been increased to 100 tons and will be shortly increased to 200 tons per day.—The mill at the Jewel mine in Long Lake camp will be completed by September. Both mine and mill are equipped with a complete electric plant. The vein is 4 ft. wide and assays \$15 per ton gold and silver, with small amounts of galena and blende. R. Roberts is manager.—A recent sampling of the Le Roy mine yielded the following results: 47% iron, 30% sulphur, and 2½% copper, with a small amount of gold and silver.—Copper ore assaying 15%, with some gold and iron, has been opened in the Columbia Copper Co.'s property on Friday creek, near Princeton, of which E. P. Wheeler, of Spokane, is manager. The vein is 34 ft. wide.—The Canada Dredging Co. is planning to put in a dredge on Frazer river. The company has a lease on 65 miles of the river and has thoroughly prospected the ground by drilling.

ONTARIO.

Surface trenching has opened a new vein on the Har-

greaves property near Cobalt. In a 1-ft. vein of calcite 3 in. are rich silver ore with occasional kidneys filling the width of the vein.—The Lewisohns, of New York, have acquired the controlling interest in Kerr Lake Majestic property. They have also purchased the Michael claim on the east side of Cross lake, adjoining the Silver Lode property, and are credited with making good offers to purchase both Temiskaming & Hudson's Bay and the O'Brien mines.—The Nova Scotia mine in the Cobalt district has opened another calcite vein in the Keewatin formation that shows cobalt bloom and native silver. Plans have been submitted for a 20-ton concentrating plant, and it is probable that the company will be treating its own ore in a short time. A. M. Bilsky is manager.—A new Sullivan compressor has been installed at the Crown Reserve and development will pro-



State of Jalisco, Mexico.

ceed at once on the 12 veins opened on the 100-ft. level. On the 200-ft. level the main vein is 5 in. wide and assays 5000 oz. silver per ton. For the first six months of this year the output has been approximately 2,000,000 oz. of silver.—On the North Lorrain property a 6-in. vein has been uncovered a distance of 500 ft.—The drift 265 ft. west of the main cross-cut on the 200-ft. level of the Beaver mine opened a 7-in. shoot of smaltite and native silver. The ore assays 9000 oz. silver per ton.

MEXICO.

CHIHUAHUA.

The American Zinc Extraction Co. has purchased three Huntington mills and will install them at its Parral plant shortly.—The La Paz mine in the Santa Barbara district has been leased to Pablo Gaudin. The ore will be shipped to the Santa Rosalia plant.—The smelter of the American Smelting & Refining Co. at Chihuahua has resumed operations after a six-day shut-down. The tie-up was the result of a freight car getting loose on the track and running into the blast-pipe from the furnace. H. R. Wagner is manager.

DURANGO.

Frank H. Husted is purchasing a 10-drill compressor plant and cyanide equipment for his Inde and Mineral del Carmen mines. The cyanide plant is to treat ore from the Santa Lucia, Santa Eduvigis, and Campana mines.

JALISCO.

E. L. Porch, of San Antonio, has organized the La Dicha Mining & Milling Co. to take over the La Dicha mines near San Pedro Analco, and the Teddy claims in the Ameca district. R. R. Landrum is now in charge of preliminary work.—H. H. Cross and H. W. Young are erecting a stamp-mill at their property at Piginto in the San Sebastian district. There is an 18-in. vein on the property that averages 1 oz. gold per ton.

Special Correspondence.

NEW YORK.

Braden Copper.—Ely Central.—Metal Exchange. — Stock Exchange Rules.—Copper Producers Associations.

The Guggenheims are inviting applications for \$4,000,000, 6%, 10-year convertible bonds of the Braden Copper Mines Co., which is registered under the laws of Delaware. The bonds are convertible at any time within ten years from June 1, 1909, into the capital stock of the company at par. The promoters of the issue state that they have already sold \$2,500,000 worth of bonds at \$101.50, and the proceeds have been placed in the company's treasury to be used to construct a new mill and for equipment and development. The company's property is situated on the western slope of the Andes mountains, at an elevation of 8000 ft.; in the province of O'Higgins, Chile, S. A. It is distant from Valparaiso by rail 159 miles, and thence by wagon-road 35 miles. It is proposed to build a railroad from the property, parallel with the wagon-road, to join the Government railroad. The company owns 101 mining claims aggregating about 1200 acres, which contain a copper deposit of a somewhat extraordinary nature. The orebody, according to Pope Yeatman, the company's engineer, lies around the periphery of an extinct volcano in shattered and brecciated diorite, close to the contact of the diorite with a mass of volcanic tuff. The periphery of the crater is about 14,000 ft. long. The orebody surrounding the crater varies between 75 ft. and 200 ft. in width, and averages over 2½% copper per ton. The ore consists of iron and copper sulphides disseminated in the brecciated diorite and in veinlets cementing shearing planes. The deposit is being developed by tunnels. Four tunnels are now being driven, the deepest being 1000 ft. below the surface outcrop. By means of these tunnels the management estimates that over 1,750,000 tons of ore, containing 2.7% copper, have been developed. And over 2,700,000 tons of similar ore have been 'partly developed'. The company is operating a 250-ton concentration mill and proposes to build a new mill, which has been designed by Mr. Yeatman, with a minimum daily capacity of 2000 tons. Based on a daily tonnage of 2000 tons, the company estimates the cost of producing the copper refined and delivered in London at less than 8c. per pound. The company's common stock, par value \$5, has been registered for listing on the New York Curb market. The Braden is the most important American mine in Chile.

The American Smelting & Refining Co. has resumed operations at its Chihuahua smelters, Chihuahua, Mexico, after a week's stoppage caused by an explosion which destroyed a portion of the main blast and necessitated the pulling of the furnace charges. The plant is not running at its full capacity. The company does not intend blowing in the additional furnaces until the metal markets assume a healthier tone. The managing director of the Ely Central Copper Co., Ely, Nevada, has completed arrangements with a New York bank for financing the company's proposed development operations. The company's shares are becoming active on the New York Curb market in sympathy with the general attention now being given to Nevada copper-mining investments.

The Board of Managers of the New York Metal Exchange, in response to the criticisms of the Wall Street Investigating Committee, has decided to conduct dealings on the Exchange in a manner similar to those carried on by the members of the London Metal Exchange. Hereafter the minimum quantities of standard copper must be of 25 tons of 2240 lb. each. All bids or offers to sell must be made in multiples of that number. Metal classification will in future be by assay returns. Commissions are reduced to \$1 per ton when trading is done with the public, and 50c. per ton when it is between members of the Exchange. Copper stored in warehouses in New York will be considered good delivery. Negotiable receipts of copper at the following works, when they contain the clause 'Lighterage free to New York', will also be deemed good delivery: Raritan

copper refinery, Perth Amboy refinery, the Nichols copper refinery, the Balbach Smelting & Refining works, and the United States Metals Refining Co.'s works. The Governing Committee of the New York Stock Exchange also announces that it proposes to act on the recommendations of the investigating commission. It has given notice that on and after April 1, 1910, the unlisted department of the Exchange will be abolished. Among the more important unlisted stocks traded in on the Exchange are Standard Oil, Amalgamated Copper, Utah Copper, and American Smelters. It is expected that some of these stocks will become listed at an early date. Transactions on the New York Stock and Curb Exchanges during the past few days were limited in volume, but prices held fairly firm. Copper stocks moved best on the Curb market, the best demand being for Nevada and Arizona copper stocks. Cobalt stocks were heavy. Tonopah and Goldfield gold stocks moved slowly. Many of the stocks on the Stock Exchange have marked time for several days. Steel Common has been very heavy since Mr. Morgan's return from London. The market gives evidence of being top-heavy, but some traders continue optimistic and look for still higher prices.

The United Metals Selling Co., which controls the Copper Producers Association, is taking steps to extend its operations to cover Europe. It proposes shortly to issue figures covering the stocks of copper on hand at important European centres, and of the rate of consumption. It is believed that the publication of such figures will materially assist in operations in copper mining stocks on the New York and Boston stock markets. Although excellent copper statistics are published by copper dealers in London every week, it is probable that an agency termed the European Copper Producers Association will be established in London to serve up statistics for American readers.

WASHINGTON.

Taft and the Tariff.—Conservation Commission.—Land Laws.

Although the President injected himself into the tariff fight at the eleventh hour, it looks as if he had won a big victory in behalf of lower duties. The bill is still in conference. Now and then some conferee leaves the meeting in a huff, only to return later and get down to business. There were serious differences, but they are gradually being eliminated. Mr. Taft is surprising everyone at the ease with which he is accomplishing most difficult things. When the tariff bill left the Senate, there was hardly a member of Congress who did not believe that it would go through in that form, as the Senate had fought the schedules out carefully and deliberately. Mr. Taft, however, with his smile and suavity of manner proposes most astounding changes and they are accepted with hardly a murmur. To the mining interests the changed conditions of the tariff bill is interesting in the extreme. Now it is free iron ore, free petroleum, and perhaps a 40c. duty on coal without the reciprocal agreement with Canada. The changes proposed are secret until the bill is reported, but it is understood from the protests made by certain Senators at the White House that this much is the program.

The National Conservation Commission has just issued a bulletin on the progress of its work. This is the organization created by Mr. Roosevelt and repudiated by Congress, which, indeed, tacked a proviso on the Sundry Civil bill to the effect that none of the Government money should go to any commission not duly authorized by Congress itself. The commission is now conducting its investigations by the aid of subscriptions from private citizens. Under the caption, 'Need of a Definite Land Policy', the latest bulletin says: "Good business sense demands that a definite land policy be formulated. The National Conservation Commission believes that the following will serve as a basis therefor: Every part of the public lands should be devoted to the use which will best subserve the interests of the whole people. The classification of all public lands is necessary for their administration in the interests of the people. The timber, the minerals, and the surface of the public lands should be disposed of separately. Public lands more valuable for conserving water-supply, timber, and natural beau-

ties or wonders than for agriculture should be held for the use of the people from all except mineral entry. Title to the surface of the remaining non-mineral public lands should be granted only to actual home makers. Pending the transfer of title to the remaining public lands they should be administered by the Government and their use should be allowed in a way to prevent or control waste and monopoly. The present public land laws as a whole do not subserv the best interests of the nation. They should be modified so far as may be required to bring them into conformity with the foregoing."

William R. Ellis, of Pendleton, Oregon, has introduced into the House a bill providing for the temporary withdrawal of lands sought to be filed upon under the Carey act. The bill provides that whenever application is made to set aside any portion of the public domain for reclamation under the provisions of the Carey act for the reclamation of arid lands and a description of the lands sought to be reclaimed has been filed as provided by law, the Secretary of the Interior is authorized to make temporary withdrawal of the lands described in the application pending consideration of the allowance of the same. Sylvester C. Smith, Representative from Bakersfield, California, has introduced a bill providing for the acquisition of private holdings in Sequoia and General Grant National Parks. Owners of non-timber land in either of the parks, under the bill may select in lieu of their lands an equal area of surveyed unreserved, non-timber, non-mineral public lands in the State of California. The owner of any timber land in either of the parks may exchange his land for an equal value of stumpage, the timber so acquired to be harvested under the supervision of the Secretary of Agriculture. The Secretary of Agriculture is to have the power to select the trees to be cut. Ezekiel S. Candler, Jr., Representative from Corinth, Mississippi, has introduced a bill which seeks to turn over all the public domain in his State for the benefit of the public schools.

A number of interesting reports of the Mineral Resources of Alaska have just been issued by the U. S. Geological Survey, the last being reports on the progress of the investigations in the Copper River region, the Fairbanks-Yukon-Tanana and Lower Yukon regions, and the Seward Peninsula. These reports are the work of F. H. Moffit, Adolph Knopf, I. M. Prindle, F. J. Katz, C. C. Covert, C. E. Ellsworth, A. G. Maddren, P. S. Smith, and F. F. Henshaw.

ROSSLAND, BRITISH COLUMBIA.

New Dominion and British Columbia Copper Companies. — Le Roi No. 2 — Fife. — Moresby Island Copper.

The developments of the last few days in New Dominion Copper affairs point to the absorption of the interests of that company by the British Columbia Copper Co. The various mines would be worked by the consolidated concern, and the smelting works would be centralized at Greenwood, where the B. C. Copper Co. is now smelting and converting its copper at less than 8c. per pound. It was intimated at the time of the sale of the Dominion property at Vancouver that it seemed strange that the Granby, B. C. Copper Co., Consolidated M. & S. Co. of Canada, or some of the other big mining companies did not make a bid on the property, more especially as the first three named had made a bid to those in charge of the old and crippled company. It was understood at the time that the B. C. Copper Co. had offered \$300,000 or over for the Dominion Copper property, and still that same property was finally sold for \$261,000 to the Hayden interests. A consolidation with the B. C. Copper Co. would be a good move for the New Dominion at this time, and would prove of benefit to the B. C. Copper Co. It is well known that smelting operations at the Boundary Falls smelter of the Dominion Copper Co. have not been very successful, although the old company spent nearly \$250,000 in an effort to place the plant on an efficient footing. The lowest cost at which copper was made at Boundary Falls was in August 1906, when it was 0.1396c. per pound. When it is understood that the B. C. Copper Co. is both smelting and converting its copper 6c. lower, then the advantage from a smelting point can be understood. Fur-

thermore, the Dominion mines are not now in a position steadily to produce 1000 tons of ore per day, and unless such a tonnage could be shipped the company would realize but small profit on its own smelting operations. A lot of development is necessary in nearly all of the Dominion mines, and it will take considerable capital to carry this out. In a consolidation with one of the large, active companies, the New Dominion Copper Co. would get that impetus that has been lacking in the old organization; it would be a money-making enterprise for the stockholders of both companies, and would be of immeasurable benefit to the communities of Greenwood and Phoenix. At the Oro Denoro mine of the B. C. Copper Co., where diamond-drill exploration is being conducted, a large body of ore has been found 85 ft. below the present workings. The Boundary ore shipments for the week ending July 10 were the lowest for some time, namely, 17,837 tons; the Snowshoe, with 2530



British Columbia.

tons, being the only shipper besides the Granby. The ore shipments will gradually climb from now on, however, as in the course of a few days two more of the augmented furnaces at the Granby smelter will be blown in. This will make six enlarged furnaces at work, and will of course mean greater smelting capacity. The six new furnaces treat 750 tons per day more than the old battery, the entire set of eight enlarged furnaces increasing the smelter capacity to 4500 tons per day, or 1000 tons per day more than under the old system.

A 20-hp. motor has been connected with the electric hoist at the Tip Top and Bay mines and development resumed. There is a 150-ft. shaft on the Tip Top, and some driving has been done on the 125-ft. level. A good strike of 15% copper has been made on the claims of the Columbia Copper Mining Co. on Friday creek, near Princeton. The lead has been pierced for 34 ft. on one side of Friday creek, and 71 ft. of tunnel has been driven on the opposite showing. The Le Roi No. 2, Ltd., has declared another dividend of 2s. per share (48.6c.). As a like dividend was paid by this company in March, they have paid in all over 97c. per share in dividends this year, and it is expected that as much more will be paid from the earnings of the current year. A new 8-in. lead of heavy ore has been found on the Blue Bird claim. This was on the northern part of the property, and is widening with depth. On the Richmond group, nearby, which is being worked by a local syndicate, a new lead of carbonate ore has been uncovered, from which assays of \$38 per ton have been taken. On the Jessie F. property, Norway mountain, the owners now have about 135 sacks of ore ready for shipment, assays from which have gone as high as \$400 per ton. Active development is going

on at the Fife mines. The ore is low-grade, similar to that found in the immediate vicinity of Rossland, containing 3 to 6% copper and \$3 to \$8 in gold. A couple of cars of ore, now available, will be shipped to the Trail smelter in the next few days.

A force of 20 men is at work opening the big copper deposit on the Contact group, Moresby island. A. B. W. Hodges, resident manager of the Granby, and his associates, recently acquired control of this promising property. It is expected that the Moresby copper deposits will outclass those of the Boundary when once thoroughly opened. In addition to being rich in copper and assaying well in gold, this ore is almost perfect for smelting, and then there is the advantage of water transportation. One prominent mining engineer has said that the conditions are ideal. Work is also to be done on the Swede group, owned by Johann Wulffsohn, of Victoria. If certain concessions can be obtained from the Provincial Government, Henry Phipps and associates, of the U. S. Steel Corporation, will spend several millions of dollars in the development of the coal areas of Graham island. Mr. Phipps and party were recently over the ground.

MEXICO.

Cinco Minas, Jalisco.—New Mills. — Jalisco Coal. — Tuxpan River Oil.—Pipe-Line to Mexico City.

Jalisco, and particularly the district of Hostotipaquillo and Etzatlan, may well feel jubilant over the reversal by John B., George E., and Fred. Farish of the opinion given by E. A. Wiltsee on the Cinco Minas in Hostotipaquillo and the resumption of work thereon by the Marcus Daly estate. The black eye given the property by Mr. Wiltsee would have had a most serious effect on many surrounding properties, and it would have taken a long time to overcome it, but now with a resumption of operations, including preparations for a 250-ton mill (probably cyanide), everyone in that district may breathe more easily. It is doubtful if any district in Mexico, distant from the railroad as it is, has shown such marked forward strides in development recently as has Hostotipaquillo in the last three years. It has been a natural, healthy growth, encouraged greatly, of course, by the contemplated extension in that direction of the Southern Pacific's Guaymas-Guadalajara line, which is now rapidly approaching. The train service is now in force between Orendain and Tequila, and by the end of the year it will be extended to La Quemada, near Tequesquite, and but a short distance from Hostotipaquillo by wagon-road. But the ores are amenable to the cyanide process, so the development and extraction is not so absolutely dependent on the railroad. More important, however, is the question of power. Electric current will be furnished over the wires of the Manuel Cuesta-Gallardo combine from the plant on the Santiago river, near Guadalajara, before the end of the year. A new 12,000-hp. plant of the Siemens-Schuckertwerke system will be erected on the Santiago river near the Totolotlan bridge. El Favor Mining Co., of Hostotipaquillo, is putting in 20 stamps, with concentrators, tube-mills, and cyanide, figuring on having all in running shape by the time the electric power reaches there. The Virginia & Mexico Mining & Smelting Co. has its 150-ton mill, the first large mill in the Hostotipaquillo district, also stamps, concentrators, tube-mills, and cyanide, about completed, and will run by steam until the power-line is in. F. G. Stevens, formerly in charge of El Favor, but now superintendent of the Mololoa, is trying to persuade the owners of that property to put in a 100-ton mill. A. J. Vick has interested San Antonio capital in opening up the Deseada. At San Sebastián, about 50 miles southwest of Hostotipaquillo, near the Tepic line, the Tajo Mining Co. has completed its primary 30-ton stamp and cyanide mill, and will begin work on ore, from the upper tunnel, running about 30 oz. silver, and 0.2 oz. gold, but as soon as the lower tunnel reaches the vein, at a point 200 ft. below the old workings, the mill will be added to and enlarged as development warrants. At the Tenamache mines, north of Santiago Ixcuintla, in Tepic, the machinery is on the ground for a 50-ton mill similar to those being erected in the Hostotipaquillo district. The

Tenamache mines are controlled by W. R. Ramsdell, who is also largely interested in Hostotipaquillo. The completion of the Southern Pacific Guaymas-Guadalajara line is of primary importance to Jalisco, Tepic, and Sinaloa, and it, together with the Mexican Central branch to Manzanillo, will give outlets for the ores to the smelters by either land or sea. Both roads will also open markets to the Jalisco coalfields, which are opening up to some importance in a district about 18 miles east of Zapotiltic, a station about 113 miles from Guadalajara on the Manzanillo branch of the Mexican Central. The coal is a clean, non-coking lignite, the highest ash so far being only 8%. It occurs in seams from 14 to 40 in. thick, with a very slight dip. The drilling has proved some 2000 acres, and the outcrops would indicate a productive field of at least 8000. Further prospecting may extend this.

In the Coahuila coalfields the labor roll has been considerably added to since the new freight rates on foreign coal and coke went into effect, and it is predicted that by the middle of next year the roll will be more than double what it was before the introduction of the new rates.

Of the more recent work in the various oilfields: though Mr. Harriman has struck oil on the Tuxpán river in Vera Cruz, as previously mentioned, at a depth of 2900 ft., it was not in paying quantities, and even now at a depth of 3300 ft. there is no great improvement; whereas the Pearson wells, farther up the Tuxpán river, show up well and strong. The Pearson's work in Tabasco, however, spread over a period of four years, and with an expenditure of some \$2,000,000, seems to have been a failure, for out of the 15 wells drilled, not one can be called a good producer, and the work for the present has been abandoned. E. L. Doheny, president of the American & Mexico Petroleum Co., has raised about \$1,000,000 for the construction of an 8-in. pipe-line, with pumping stations, between Ebano, San Luis Potosí, and Mexico City, a distance of 105 miles, which he hopes to have completed early in 1910, and which will be used to furnish oil for making gas to supply Mexico City. The company has at Ebano 15 producing wells with an output from 100 to as high as 8000 bbl. of oil per day from one well. There are 12 others being drilled. It is one of Mexico's important fields.

BUTTE, MONTANA.

North Butte — East Butte. — Amalgamated Labor. — Zinc.—Raven Copper.—Snowstorm.—Butte Extension.

The interesting feature of the North Butte now is the Jessie vein, expected to be reached by the cross-cut on the 2200-ft. level about October 1. Connections are to be made with the Boston & Montana company's Badger State shaft, which is being sunk to reach the extension of the Jessie vein. The North Butte company is raising on the 1200, 1400, and 1600-ft. levels in the Granite Mountain, which it bought some time ago. The Lewisohns, who sold the Edith May, thought they had a big mine in the Granite Mountain, but after sinking the shaft to the 500-ft. level, dropped it. The North Butte expects to complete its second working shaft by January 1, 1910.

The East Butte is smelting 400 tons of ore per day at the Pittsmont smelter, and has put in commission one new furnace and one old one. The Pittsmont company was unable to develop any ore reserves while mining, the ore being extracted to pay expenses as fast as developed. The East Butte went to great expense to run a long cross-cut from the bottom of the main shaft on the 900-ft. level to tap the Glengarry vein, cutting a number of small veins of little value in the intermediate territory, and opening a water-pocket that drowned out the miners and suspended everything but pumping. Competent mining men believe that the company will have to go down to the 1800 or 2000-ft. level to properly develop the mine, and had the money spent on the long cross-cut described been used to sink the big shaft, No. 11, near the Glengarry vein, to the 1500-ft. level, that would have determined the value of the vein. Although the No. 1 shaft is down to the 900-ft. level, the developed territory from the surface to the 400-ft. level shows only ore of low grade.

The Davis-Daly Estates company is shipping 100 tons of ore daily from the Colorado shaft. The vein is being worked on the 1200 and 1400-ft. levels, and a winze is being sunk from the 1400 to the 1500-ft. level to the west. The vein runs northeast and southwest, and the work is all in good ore. It is the policy of the Amalgamated Copper Co. henceforth to employ American labor in place of foreign, when possible, and to give the men from the countries in northern Europe preference over the Slavs, Austrians, and Montenegrins. The company has experimented with the latter labor for several years, and found it unsatisfactory. The rule will apply to the mines as well as the smelter of the company, it is understood. The south Europeans are said to work hard, but they lack the intelligence of American and northern European laborers. The stock of the Butte-Balaklava Copper Co. will be listed on the Boston Stock Exchange, the stockholders lately having taken steps to dissolve the trusteeship.

It is reported here that the Clarks have found a successful method of treating the zinc ores of Butte, and it is

half as a result. Butte people are puzzled by the unusual stories from the Greenoughs and the passing of the dividend. The report of the general manager, F. H. Cooney, of the East Butte Extension Copper Co., says that lessees are working the mine day and night on development, and that the debt of the company is less than \$4000, with practically no current expenses. The company will elect directors on August 15. The McKee group of mines in Madison county has been sold for \$32,000 cash. They are situated at Meadow Creek, and the purchasers, W. R. Allen of Montana and a group of Chicago capitalists, will develop them extensively.

NOME, ALASKA.

Russian Laborers.—Nome Surf.—Tuluksak Stampede.—Cape York.

The steamer *Victoria* from Seattle arrived June 12 at Nome with 387 Russians. They were allowed to land, but the city authorities, aided by the customs officials, deported a bunch of them on the next steamer. Many were destitute



Front Street, Nome.

given out on good authority that W. A. Clark and his son, W. A. Clark, Jr., will build a large mill here.

The new Raven Copper company, organized in Maine, has taken over the property of the Raven Mining company, the transfer having been made here by the stockholders lately at a special meeting, at which more than two-thirds of the stock was represented. The new company pays \$50,000 into the treasury and takes the property, subject to the mortgage of \$65,000 and interest, the \$20,000 floating debt to be lifted with part of the money paid into the treasury. Old stock may be exchanged by paying 25c. per share for the new, the old being given a value of 50c. per share, before August 31. The 370,000 shares of old stock in the treasury will be replaced by an equal quantity of new. The president of the company received a telegram from Boston saying that owners of 510,000 shares of stock have paid the 15c. per share payable by July 19, many paying in full. It is expected that work on the mine will be resumed within a month, when the incline will be sunk to the 1500-ft. level and cross-cuts be sent out on the 1300 and 1500-ft. levels.

The conflicting reports about the condition of the Snow-storm mine at Wallace continue to interest Butte people. The latest story emanating from the Greenough camp is that the railroads are trying to hold them up with excessive freight rates, and that ore shipments will be cut in

and were arrested and placed in the local jail as vagrants. Who imported them is yet uncertain. Some of them have secured work with Fleming Bros. & Hanks, the Pioneer, and other companies. Work of the season is now well under way. The Nome Surf Mining Co., backed by Tacoma capitalists, is installing a steam-scraping plant along the shore of Bering Sea, sanguinely expecting to make large clean-ups of beach gold from the surf-washed concentrates. In 1905 and the year previous, several similar ventures proved failures, and the wrecks of their exploitation may still be seen half buried on the beach. A recent attempt to dredge in the same place by Lane's big scoop dredge proved the ground under the sea to be frozen a few feet below the surface. The bedrock tunnel from Iron creek to Pilgrim river, put in by Waskey & Co., is completed and in operation. The detritus is dumped into Pilgrim river and carried off by the current. Good results have been obtained from the work inaugurated. Fred. Lind, a quartz miner of Nome in 1901, committed suicide at Cordova on June 25, by shooting himself in the head. Walter E. Clark, the new Governor of Alaska, was a Nome beach miner in 1900, and is well known here. Lutschinger's submarine mining venture with Russian lessees has proved disastrous. They lived extravagantly, worked leisurely, got money and machinery for operation of a local bank, and then deserted the dump,

which the bank ascertains is hardly worth sluicing.

Several discoveries of rich ground are attracting attention. The diggings on the Tuluksak, a tributary of the Kuskokwim river, are reported as being rich by arrivals from that region who have gold dust, and are buying outfits to return. A big stampede is occurring from Nome, and every conceivable kind of craft is being chartered. Nome will be depopulated if the stampede keeps up till fall. Bangor creek, tributary of Snake river, near Nome, is the scene of an important placer-discovery. A streak of gravel 3 ft. thick, averaging 4c. per pan from rim to rim, is being ground-sluiced. The Cape York Tin Mining Co., Andy Baumgartner, manager, is being surveyed so that it may be patented. Several new stringers of cassiterite ore have been cut by a tunnel 100 ft. into the mountain. The main vein is expected to be intersected before the close of navigation. An attempt to mine for rubies will be made on the Bluestone river near Teller. H. A. Ring has orders from an Eastern firm for \$100,000 worth of the uncut stones to be delivered in Seattle before the close of navigation. Rubies in the rough have been selling in Nome for 50c. each for years. These came from several creeks near Gold Run. Quartz mining is looking up, and many reputed valuable locations are recorded with the U. S. Commissioner's office. The Connolly mine and recent extensions will be dropping stamps before August by water-power on Gold Bottom creek.

GOLDFIELD, NEVADA.

Ore in Clermont Shaft. — Consolidated Development. — Activity of Lessees — Mining Congress.

The discovery of a large body of good ore at a depth of 730 ft. in cross-cutting from the Clermont shaft is regarded as vitally important, not only to the Consolidated Mines Co., but to the entire Goldfield district, in its influence upon future operations and in confirming the belief that the ore-bodies of the district will be found to extend to great depth. J. H. Mackenzie, the manager, who is always reticent and extremely cautious in speaking of new developments, says that the ore carries not less than \$30 per ton gold, and that it is distinguished in character from most of the company's ores by the absence of base material and by being more readily amenable to milling. It is now known that much of this ore is far more valuable than was indicated by the first announcement. The find is believed to be a downward extension of the rich Macmillan ore-shoot from which the Mohawk-Jumbo lease, on the Gold Wedge Fraction, took nearly \$200,000 worth of high-grade ore. The statement has been made by a miner employed in the Clermont workings, but lacks confirmation by the company officials, that the cross-cut from the 1000-ft. station of the Clermont shaft has passed through 40 ft. of a vein in which free gold is plentiful, and samples from which run as high as \$125 per ton.

The two mills of the Consolidated Co. are treating over 700 tons of ore daily, the mill-heads being maintained as nearly as possible at \$27 per ton, and no high-grade ore is being extracted from any part of the mines, all being left standing or, when necessary to break it down in the course of development, stored in the workings until the time when it is required for mixing with the low-grade product. A winze is now being sunk in a large body of good ore from the 600-ft. level of the Mohawk mine; at the 403-ft. level the stopes have exposed a large tonnage of exceedingly rich ore with large seams carrying as high as \$10 per pound; the big vein to the east of the shaft is being further explored. The stopes to the north of the shaft above the 400-ft. level are proving up some large bodies of mill-ore, together with high-grade, and the great deposit at the southeastern extremity of the claim is being blocked out by stopes and raises between the 400 and 600-ft. levels. The principal tonnage for the big mill is still coming from the Mohawk. There has been a constant improvement in the 260-ft. south drift from the Red Top and the connecting stopes extending into the Lucky Boy, from which a large and even production is being made, and particular interest attaches to the results of driving from the Clermont shaft at a depth of

600 ft. for the extension of this orebody. Good ore has also been exposed in driving north from the Red Top shaft.

During the past fortnight there has been a marked revival in mining operations throughout the Goldfield district, as a result of developments on the Consolidated, Daisy, Belmont, Great Bend, C.O.D., Velvet, and Victor. Upon all of these rich ore has been developed at entirely new points. The revival has manifested itself primarily in the resumption of operations on territory that has been idle for some time and in many applications for leases upon undeveloped ground. On the C.O.D. work will begin at once at two points. Thomas A. Lister, who is operating at Lordsburg, N. M., and who formerly conducted the Goldfield Fargo lease on the C.O.D., has arranged to resume work and sink to great depth. He has also obtained from L. K. Koontz, manager of the C. O. D. Consolidated, a three-year lease on the eastern portion of the same claim, embracing a portion of the old C.O.D. M. & L. ground, upon which he has lately found some high-grade ore in prospecting near the surface. This block yielded a fortune from a shallow shaft near the eastern boundary in the camp's early days, and the new lease will begin operations as a shipping enterprise. Philadelphia operators have secured two leases under terms requiring them to sink 1000 ft. at once, on the Poleverde claim, the joint property of the Consolidated and Jumbo Extension companies and adjoining the Clermont and Velvet claims. Both these shafts will be of two compartments and timbered in substantial manner. On the Laguna driving is in progress from the 720-ft. level of the old Hazel shaft by the Chicago Cleveland Co., under the management of William MacKay, who found the rich ore in the bonanza Frances-Mohawk lease. Small seams of good ore have appeared in these workings at 718 ft. depth. Specimens of oxidized ore, spotted and sprinkled with free gold, are being taken from the old Detch-Brewer stopes on the Daisy, 65 ft. deep. The ground was taken under a sub-lease by Bruce Jones and Guy Millard, upon a 50% royalty basis, and they have already stripped 20 in. of exceedingly rich ore for a distance of 8 ft. with three days work. Shipments of \$105 ore are going out from the recently exposed ore-shoot at 360 ft. depth on the Golden Daisy lease. The Daisy company has found good ore in the original incline shaft near the eastern boundary. Some of this ore is now being included in the daily shipments, and driving is in progress from the main workings toward this orebody. North of the Daisy 800 ft. and on the extension of the main cross-fissure of the Daisy, shipping ore averaging around \$100 per ton is being mined at a depth of 62 ft., on the Goldfield Belmont, by lessees working the upper levels of the company shaft. Since this ore was found the company has started work at a deeper level and is seeking the same orebody.

Three shafts belonging to lessees on the Atlanta are now in the dacite, with assays showing low-grade mill ore at several points. The Fairview-Cherokee has let a contract for 100 ft. additional sinking from the 500-ft. level, and may continue to 800. The Precious Metals lease has milling ore and is sinking. The Maloney lease is developing at 630 ft. and several others are preparing for development at depth. The Golden Pick lease on the Pipe Dream claim of the Silver Pick, adjoining the Combination, is driving north and south at two levels in a strong quartz vein. Sinking is in progress at three points on the eastern slope of Vindicator mountain, by the Gold Button Co. and two lessees on the Talmage group. On the Red Mountain belt the Nancy Donaldson shaft has been timbered to the 100-ft. level, and is being sunk to depth with good ore in sight in narrow seams.

The keenest interest is being manifested throughout the State in the forthcoming session of the American Mining Congress, which meets in Goldfield on September 27. Commissioners have been traveling over the State, visiting the various mining district and soliciting specimens for a mineral exhibit. Samples are arriving daily from various camps, and are being assorted and classified by experts. It is now apparent that this will be one of the best collections of ores and minerals ever assembled in the country. The Consolidated has hoisted from the 403-ft. stopes of the Mohawk mine, for this exhibit, two blocks of high-grade ore each weighing 500 lb. and said to be valued at \$15 per pound.

JOHANNESBURG, TRANSVAAL.

Speculative Mania.—Haphazard Pegging.—Labor Shortage.—Mechanical Ventilation.—Output Record.—Rand Yield to Date.—Safety Regulations.

For many months the share market has been gaining strength, and its condition has been so remarkably buoyant during the last two weeks as to gain from the excitable or hopeful the appellation of a 'boom'. Fortunately, no real 'boom' has yet arrived, and although many of the more speculative stocks are five or ten times as high in price as a year ago, the advance has been gradual over a number of months, with occasional 'healthy reactions'. Stock exchange conditions are rarely dealt with in these letters, but there are times when they assert themselves forcibly. Such is the case at present. The turn of the tide in the financial world has created a spell of almost unexampled activity. Johannesburg is wonderfully busy. Geologists are visiting properties in all quarters and are endeavoring to discourage their principals from attempting impossible chances. Others are flying to option farms and cheerfully refuting, with characteristic confidence and breadth of view (regardless of detailed facts), the existence of 'Main Reef' extensions at shallow depth below the coal measures, dolomite, 'Black Reef', or what not. Mining engineers are busy with schemes for expansion honestly proposed by the controlling 'houses'. Mechanical engineers are overwhelmed with the sudden mass of work falling upon their shoulders in connection with the electrification of the industry. 'Peggers' are out all over the country. The Government will reap a big harvest (for a few months at least) in license money in respect of the many thousands of claims staked by ignorant enthusiasts for whom every stretch of conglomerate means a potential Robinson and every float boulder the trusted marker of a sub-outcrop of the Main Reef. Of course the crash must come, but such is the dazzle of the Kaffir market, with all the lights turned on, that it is difficult to prophesy the limits of the excitement.

That there are many favorable features presented by recent developments on the Rand is true. The good grade exposed in the City Deep—with its million tons of \$8 ore over 3000 ft. deep—and the favorable results obtained in the basin of the Far East Rand, are a 'host' of good news in themselves. Further, the gold-content of the South Reef and the Main Reef Leader shown in the Turf shaft at 3900 ft., though not high, is payable, being about the same as that of the Village Deep above. The labor position, at one time the all-important factor, has for the past year been allowed to pass out of calculations. It requires but small foresight, however, to perceive that the obstacle to progress presented by scarcity of native labor will soon be seriously felt. With a shortage prevailing for the mines already producing or developing, the conceivers of bold schemes for the conversion of thousands of idle reef-bearing claims in the Far East Rand into active properties should at least ponder the possibilities of labor difficulties.

The artificial ventilation of Rand mines on an extensive scale has been discussed intermittently for at least ten years, and its economic possibilities have been frequently enunciated. While its ultimate necessity in the deep-level mines of the future has been fully recognized, its advantages in the mines of today have not been. The ventilation of the lower levels of the East Rand Proprietary Mines having been poor when natural means were relied upon, some parts of the property being so notoriously bad that it was impossible to get good miners to remain at work in them, it was decided some time ago to put in a Sirocco fan. The success of the innovation attracted fresh attention to the benefits accruing from good ventilation, and it is probable that the lead set by the E. R. P. M. will be followed by other companies. The fan was 10½ ft. diam., with a capacity of 300,000 cu. ft. per min. at 4-in. water-gauge. The Transvaal Government Regulations call for a supply of 70 cu. ft. per man per minute. Generally speaking, the mines of the Rand have been fairly well off in the matter of natural ventilation, which is favored by the regular schemes of development

and the steep dip as compared with the coal mines. The increase of rock-temperature with depth has been too small to make the demand for artificial ventilation urgent, and the strata have not flattened as rapidly as was anticipated. It is undeniable, however, that the good reputation of the Rand's natural ventilation has been responsible for allowing neglect in individual cases. Since the discussion between chemists and doctors in 1903, the intimate association between mine-gases and those fatal sicknesses to which the Rand miners are liable has been universally acknowledged. For many years the cry of those anxious to fight for the miners' protection of health has been, "water for the dust; ventilation for the gases."

The Transvaal gold output for May establishes a new record. The aggregate of £2,652,699 surpassed the previous record, for December 1908, by the narrow margin of £956, when allowance is made for the withdrawals from gold reserve included in the 1908 declaration. The yield for the first five months of the current year now reaches £12,825,729. It appears probable that the yield for 1909 will exceed £32,000,000. Much depends on the labor supply. The decrease in May was 4622 natives, and 7700 Chinese will soon be repatriated. The magnitude of the winter exodus of Kaffirs to their kraals will be an important factor in determining the speed with which schemes of output expansions may be accomplished. The Government has been trying to obtain a mine to be used as a training school for miners, in accordance with an arrangement entered into with the Chamber of Mines, but has so far failed to find one which would be satisfactory.

The Transvaal Chamber of Mines has issued its usual report for the year 1908, which is full of interesting and suggestive points for those with the leisure to peruse its voluminous pages. The total declared output of the Rand, together with the unrecorded yields for certain periods, is given at 50,785,785 fine ounces, worth £215,724,300, from the industry's inception to the end of 1908. Adding the returns for the first five months of this year, we arrive at an aggregate exceeding the enormous figure of \$1,120,000,000.

Mr. Fergusson's paper before the S. A. Association of Engineers, on the relation of safety to economy in mining, though lacking in point and decisiveness, has led to serviceable discussion. It is generally conceded that Mr. Fergusson's estimates of financial loss through accidents were conservative, and failed to represent the magnitude of this ill-defined debit. Apart from serious accidents, duly reported to the Government Mines Department, there is a host of minor accidents, which appreciably reduce the efficiency of the labor complement. The attitude taken by the Government Mines Department is that of encouraging or forcing the companies to increase their supervisory staff, and to make the question of underground safety the special care and responsibility of some competent person or persons, instead of allowing it to be one of the many matters for attention comprising the daily routine of the shift-boss. The suggestion expressed, semi-officially, by Mr. Kotze (Government Mining Engineer) that the Mining Regulations were to be expanded in regard to necessary measures for the prevention of accidents, has not been welcomed in mining circles. It is declared anew that the Rand Industry is sadly 'over-regulated', and is burdened with more official injunctions as to the things to be done or not to be done than any other mining district in the world. In regard to certain aspects of underground work, the Australian regulations are probably as detailed and onerous. There is good cause for complaint, however; fewer regulations more strictly and rationally enforced would be more suitable to Rand conditions than the existing miscellany.

At the last monthly meeting of the Chamber of Mines, the President made the satisfactory announcement that the Chamber would soon be in a position to erect a Miners' Phthisis Sanatorium. While prevention is better than cure, and every effort should still be made to check the ravages of this disease, the seriousness of which can scarcely be realized by mining men in other fields, the establishment of such a Home will serve a good purpose, and, by providing the needful attention to the sick, may be the means of saving many miners.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Cinnabar occurs on Palmer creek, in Oregon. It has been found here only in stream-gravels, and has not as yet been traced to its source in the surrounding rocks.

Aluminum is difficult to solder, and welding with the electric arc is better; but a solder consisting of 45 parts tin and 15 parts aluminum may be used successfully if the surfaces to be united are previously cleaned of the film of aluminum oxide by abrasion.

Insulation of electric wires underground is extremely difficult. Up to 300 volts at least it is better to use bare wires, and many engineers consider that 500 and 600-volt feeds had best be installed bare, but so placed as to guarantee the maximum amount of safety.

Direct-current cables for transmission in mines should be concentric with the inner wire negative. To prevent fire spreading in case a cable should break down, the cable should be wrapped with asbestos strips about 3 in. wide and $\frac{3}{16}$ in. thick, the strips soaked in a solution of silicate of soda and wrapped on while soft.

Barium chloride is sometimes used for softening boiler-water. It transforms sulphates of the alkaline earths into barium sulphate and the chloride of the earthy base. Barium sulphate does not form hard scale, as does calcium sulphate. When magnesium sulphate is present, magnesium chloride is formed. This is an extremely corrosive salt.

Hard iron ore from Clinton horizons in the Birmingham district of Alabama is generally high in lime. Such ores on weathering yield a soft ore rich in iron by the process of residual concentration. With the exhaustion of the rich outcrop ores the hard ore has come to be used in larger amounts. The fact that it is high in lime and low in silica makes it available as a flux for the brown ores of the region.

Tonopah ores are essentially silver-bearing, the ratio of silver to gold being as 100 to 1. Both oxidized and sulphide ores are worked. Zinc, manganese, and copper are present in all the ores, but not in quantities sufficient to interfere with cyaniding. At the Montana-Tonopah mill the method of fine-grinding and agitation is the same as that so widely and successfully applied in Mexico.

Limestone in regions subjected to excessive metamorphism or to volcanic activity, is often altered by the action of gaseous emanations and infiltrating waters. Profound changes may occur in the chemical composition of the limestone without revealing the alteration to the eye. This is especially the case when silica has been introduced. Limestones may in this manner develop a great variety of crystalline silicates, such as garnets, pyroxenes, hornblendes, magnetite, spinel, titanite, tourmaline, apatite, and others, so as to superficially resemble altered forms of igneous rocks.

Basaltic columns are caused by the development of jointure in igneous rocks on cooling. The resemblance to crystalline form is only incidental, not structural. The number of sides of the prism may vary from three up to six. The longitudinal axis is always perpendicular to the surface of cooling; hence in effusive lavas it is vertical; sometimes the columns radiate from centres in a fan-shape; while in dikes they are perpendicular to the walls. Columnar habit is not confined exclusively to basalt.

Briquetting machines vary in capacity with the design and size. The Johnson machine used by the United States Geological Survey in testing had a capacity of 6 tons of briquettes per hour when making rectangular blocks $6\frac{3}{4}$ by $5\frac{1}{2}$ by $4\frac{1}{4}$ in., weighing 6.8 lb. each. When making briquettes $6\frac{3}{4}$ by $4\frac{1}{4}$ by $2\frac{1}{2}$ in., weighing $3\frac{3}{4}$ lb., the capacity was 3.8 tons. The Renfrow machine, making cylindrical briquettes with convex ends, measuring $3\frac{1}{4}$ by $1\frac{1}{2}$ in. and weighing 11 oz. each, had a capacity of 8.9 tons per hour.

Mine fires in European mines have in the past been the cause of loss of life. In Germany, at much expense, elaborate fire-fighting facilities are provided, resembling in every particular a well appointed fire-brigade station such as is maintained by some of our cities, having fire-engines, horses, and a crew of trained men. Many stations are equipped with different types of rescue apparatus and men trained in their use. In Austria a law requires that each mine shall be equipped with such apparatus, and at all times a certain percentage of the under-ground employees shall be trained in its use.

Safety lamps in England are carefully inspected before being taken into the mine, and upon reaching the bottom of the pit a mine official makes a second inspection of the lamp to see that it is in good condition. It is forbidden to set a safety lamp on its bottom in any part of the mine. When a workman wishes to place his lamp to one side, he must hang it in a safe position. In Belgium the lamps are looked over by an official on the outside of the mine, to see that all of its parts are properly assembled. In Germany the lamps are handed to the miners cleaned and locked. They examine them to ascertain if they are in condition suitable for use.

Volume changes as a result of metamorphism are unimportant in the Hanover, New Mexico, district. In those beds less susceptible to pneumatolytic changes the alteration has been of the nature of re-crystallization, with possible silicious additions. Apparently the purer limestones, as the carbon dioxide was driven out, were invaded by magmatic solutions at high temperature, and any tendency toward shrinkage was counteracted by accessions from the magma. The elements native to the intruded rock, such as lime and silica, which were of a proper nature to form contact minerals, combined with materials from the magma, the whole forming a solution from which the present minerals originated, and the newly crystallized rock occupying the same bulk as that which was antecedent.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Comstock Bullion.

The Editor:

Sir—In your issue of July 3 you speak of the Comstock Lode as a silver lode, and intimate that Mark Twain was a product of Comstock bonanzas, while the truth is that the Comstock bullion was nearly as rich in gold as in silver, and the world is indebted to a Comstock borrasca, and not to a bonanza, for Mark Twain. Mark Twain left the Comstock because at the time he could not find work to do. As to 'Who shall balance the scales and say which has contributed the more to the joy of the world?', Mark or the three hundred and fifty million dollars, the task is easy. Mark takes the prize, for when the Comstock's millions are charged with the tears that were shed and the blood that was lost in their winning, it will take a large part of the untold millions that the old lode can yet be made to yield to put the account in decent shape, while in the life and works of Mark Twain it may be said of such parts that are not all joy, that his "sweetest songs are those that tell of saddest thought."

To return to the Comstock bullion: while it has ranged from 1½ to over 50% of gold, the bulk of the output contained 40% in value of gold. The mines of Cedar hill yielded bullion worth over \$10 per oz.; the mines of Silver City still yield such bullion—Cedar hill being the north and Silver City the south end of the Comstock. The placers in the canyons from the north to the south ends of the lode still yield gold bullion.

The mistake in speaking of the Comstock's output as silver is natural, as it is not long since Nevada was known as 'The Silver State'. They had a silver party there, and professed to believe that the builders of the Republic were right when they wrote into the Constitution: "No State shall make anything but gold and silver coin a tender in payments of debts." But now it is taught that the nation has outgrown the Constitution, and that the Declaration of Independence was an iridescent dream. Even in the midst of such teaching it were well to hold on to the multiplication table and obey the Constitution until the wise men are prepared to submit in the manner duly prescribed, a better Constitution. There seems to be no logical objection to the closing appeal in Judge Fitzgerald's work, 'The Thirty Years' War on Silver,' when he says: "But when the days again come when the Constitution of the United States is observed and obeyed in the letter and in the spirit, there will be then days of gladness. Then will prosperity smile in the valleys and upon the hills and upon the mountains. Let the people honor the principles and obey the precepts of their fathers, that their days may be long in the land which the Lord their God hath given unto them. Honored be the men and women who shall aid and guide them to the observance of

the principles and in obedience to the precepts of the fathers as they are expressed in their Constitution of Government."

G. McM. Ross.

Stockton, California, July 21.

The Sacramento Anti-Dredging Convention.

The Editor:

Sir—It may be of interest to some of your readers not in touch with local events to see how the prejudice of the farmer against the miner was again revealed when the delegates to the Anti-Débris Convention assembled this week in the city of Sacramento for the purpose of discussing the effect of dredge-mining upon the farming industry. From the course of the discussion the word 'discuss' must here be taken in the sense of 'to break up; to drive away', and not in the sense of 'to examine in detail'. The relation of this phase of the mining to the farming industry is such that in every instance when extensive dredge-mining is carried on, the ranches and the towns have been directly benefited, and today great activity and prosperity are found in districts which were almost dormant previous to the advent of the dredging companies. The cause of the quiet tone of the meeting may be found in the fact that some of the delegates were in harmony with dredging, due to their having investigated conditions before going to the meeting. All of the delegates were invited, and every facility was offered them to investigate and see the existing conditions for themselves, but only a few cared to do this. Some came to the meeting without ever having seen a dredge or the conditions in the field. However, one delegation which did go witnessed the blasting of a hillside into the Feather river along the Western Pacific railroad, and saw men employed in shoveling broken rock and dirt into the stream, the very thing the dredges are condemned for doing; yet the contention at the meeting was that dredge-tailing obstructs the streams and is the cause of the destruction of a great deal of land by floods. As there are no dredges working directly in the rivers, excepting those performing assessment work on the Yuba river, this can not be true. In any event, it would be impossible to place the blame for these floods on any one industry without extensive investigations extending from the headwaters of the various streams down to the overflowed territory.

One speech had for its base the destruction of the land for all time to come, affirming that 800 acres of the greatest vineyard in the world was being sacrificed, that choice valley land was being permanently blighted, and finally, that most of the money derived from these operations is sent away to Eastern stockholders. Merely casual inquiry would prove how unfounded and prejudiced is such a statement. At the place referred to, for every acre of vineyard dug up two acres are being planted on adjacent land owned for this purpose, and finally, when all of the 800 acres shall have been turned over, the ground will be leveled and a new vineyard planted. It is a proved fact that vines planted on dredge-tailing produce fruit that matures earlier and has a better flavor than that grown on ordinary soil. It also re-

quires a smaller percentage of water on dredge-tailing. The choice valley soil that is being 'blighted' will also be made productive, and where nothing grew before, in the future it will be utilized for farming. It is also an established fact that eucalyptus, fig, orange, almond, and many other trees, do well and grow rapidly, even on unleveled dredge-tailing, requiring no fertilization. One has only to visit J. H. Leggett's place at Oroville to see a demonstration of these things.

Furthermore, the dredge cobble-stones are being removed to crushing plants on the railroad for ballast. In the Folsom district alone are two large rock-crushing plants, and it is safe to say that if the county of Sacramento will use the crushed rock from these plants for road construction, in a few years there will not be a pebble left on the dredged area above the natural level of the ground. At Oroville there is one rock-crushing plant, and the railroads have acquired several hundred acres of dredged land and are hauling the cobbles away for ballast. At the present rate it will not be many decades before all of the land of the district will be restored to its natural level. Instead of the dredge companies sending their earnings away, the Natomas Con. Co. alone is bringing into the Sacramento valley millions of dollars from foreign sources. At present this company is preparing to reclaim tens of thousands of acres in the Sacramento valley, and in a few years they will have populated and made that part of the Sacramento valley which is now a waste, a garden spot in the State.

San Francisco, July 24.

W. B. WINSTON.

The Editor:

Sir—The most noticeable feature of the convention called by the mayor of Sacramento, and held in that city on Wednesday last, to discuss the dredge mining industry and its effect upon the rivers of the State, was the great diversity of opinion among the delegates themselves as to the cause of the present condition of the rivers. The delegates were agreed that the Feather and Sacramento rivers, during extreme high water, have materially damaged farming lands; but, while some of the speakers assumed that the dredging operations were the sole cause of the raised water-plane of the rivers, and the consequent injury to the agricultural interest, no one seemed prepared to assign a particular cause; that is, there seemed to be neither proof nor argument to show whether the dredging operations were the proximate cause of the trouble, or whether natural conditions would have brought the same results. In short, the convention seemed to lack a major premise on which to base a resolution.

Many delegates spoke, but there were as many opinions as there were speakers, some believing that the dredging industry, and nothing else, was responsible for all the resulting damage, and others maintaining the contrary view, even in cases where the speaker had suffered seriously from the overflow. The first real light was thrown on the subject by State Engineer Ellery, who said, in substance, that the main question before the convention, and the one that brought the convention together, could not pos-

sibly be determined until a mass of data, based upon careful observation and measurements of the rivers at various points, had been secured. Capt. Thos. H. Jackson, U. S. A., of the Anti-Débris Commission, stated that the Commission had determined that dredge-mining, excepting in one or two cases, had not done any injury to the channel of the river where it was carried on.

The only business actually transacted by the convention was the appointment of a committee to investigate the subject, to report favorably upon dredges that were operating without injury to the rivers, to expostulate with any dredging company that in the opinion of the committee was doing damage, and if expostulation was of no avail, to call in the aid of the Anti-Débris Association in dealing with the offender. It appeared that if the convention had procured such information in advance it would have had either better cause to convene, or no cause at all.

B. S. NOYES.

San Francisco, July 23.

A New Proposal for Silver.

The Editor:

Sir—Concerning a suggestion made by certain parties in America to "resume the free coinage of silver, collect all duties in gold, place a prohibitory import duty on silver, and secure an agreement with Mexico, Peru, and Bolivia to do likewise," the question arises, could the situation be controlled? I should think so, most decidedly. Does not the tariff create an artificial price on every commodity on which even a small duty is laid? Does not the price of arriving South African gold advance in London whenever the bankers of Paris, Berlin, or any other European financial centre want a part of it, compelling the Bank of England to pay just so much more per ounce if it desires any? Of course it would be advisable to include Canada in such a 'Bund', for that country is now the fourth largest producer of the white metal in the world, having yielded 12,750,000 oz. in 1907, which was exceeded only by Mexico with 65,600,000, United States with 58,850,615, and Australia with 17,516,433, while Bolivia and Peru together produced only 12,000,000 oz. The three principal nations of North America, producing as they do over 70% of the world's annual crop, acting together, could advance the price of the metal to \$1.30 per oz. before a single coin was minted. The United States and Mexico in concert, with their combined output of nearly 65% of the world's total, could do the trick with ease. The United States alone, as it is producing over 30%, could accomplish the rehabilitation of the metal, in my opinion. Who controls the price of wheat all over the world but the farmers of the Mississippi Valley, who produce less than 20% of the world's crop, and have now less than 5% of that total for export? Who makes the international price on cotton but the Texas planter, or of wool but the Australian sheep farmer, or of sugar but the Cuban and Hawaiian producers? Similarly, the American miner would name the market price of silver, if the natural right had not been taken from him by legislation. What would happen to the price

of beet sugar or wool if the congresses of the leading nations should pass laws to the effect that only cane sugar could be used as food, and only cotton as a fabric for clothing, or vice versa?

But would it be wise to attack the problem in the way suggested? That is the real question. I think not. Two wrongs do not make a right. One unnatural step does not warrant another of the same kind as a corrective, even were it possible to make it. It is beyond hope to expect that a Congress perspiring in Washington over tariff rates on toothpicks, buttons, and ladies' hose, would have time to consider other matters of apparently greater importance. Any attempt to secure united action on the part of the three North American nations, or any two of them, would meet innumerable obstacles, and take years of negotiations. England would block Canadian participation, and the large foreign capital interested in Mexican banks would fight desperately for their acquired right to float paper money.

No, the commercial world is deeply in trouble on account of the outcome of the single gold standard, but does not yet appreciate what is the matter, and will not find out by being told, except by their own chosen prophets and wise men, and the latter are scanning the horizon in every direction for a way to re-open the question without drawing down on themselves the imputation of fickleness and inconsistency. It will pay to let them perspire freely for a time. Europe (except France, whose wise financiers practically retained bimetalism, while nominally abandoning it) is in hard straits for metallic money, though it gets the immense South African and Australian output. The United States can afford to stand pat on the problem, having abundant gold resources of their own, and can wait until England, Belgium, Holland, Germany, and Austria learn, through experience, what is the matter with their system. They will never reach this knowledge through argument. The majority of financiers, including the Americans, are obstinate and prejudiced, and poorly informed on the question of money. Any effort on the part of silver producers, or the citizens of silver producing regions, to re-open the subject of the free coinage of silver by legislative action would merely revive the arguments promulgated in the campaign of 1895 in the editorial columns of the urban press.

Apparently all that silver producers can do is to quietly present statistical facts from time to time, without argument and without suggestion of a resumption of free coinage. Of prime importance is the dissemination of a correct knowledge of business conditions and methods of trade in Asia and Latin America, where there are large populations of semi-civilized people on whom we would like to confer some of the blessings of civilization, and who raise a cry of 'murder' and run if shown a gold coin. They have an enormous capacity for the absorption of silver, and will take it at the rate of thousands of tons per annum, and will pay for it in labor and produce, at the old ratio of 16 to 1. We could sell them an unlimited quantity of our manufactured goods. Out-numbering the occidentals three to one, and so far as laborers go, ten to one, the balance of trade always has been in their favor, and always will be until they

reach the Western level of civilization. The trade-balance has always been settled in silver, and it is their preference to continue that arrangement. The West has the silver, and silver mining is one of the most profitable of industries, with the metal at its ancient value. Apart, then, from the money question, it is to the interest of the great commercial nations to look for ways and means to advance the commodity value of silver to the ratio to which the uncommercial nations are prepared to accept it. The opposite plan of cheapening its price, so that the foreign trader could buy it in the market at his own figure, and then make a profit in paying it to the Oriental at the old ratio, has been thoroughly tried out, and has proved to be, like all tricks, of no permanent advantage. The wily Asiatic trader has learned the game, and is now gathering these little profits himself. Meanwhile silver has been so discredited here that the miner is producing it at a loss, or at far less than he should receive, or else as a by-product; and the trader at Hong Kong, Calcutta, Bombay, Singapore, and other Eastern ports is the only man who has gained by our foolishness. He can still pass off the silver on the laborer of the interior for the produce of the land, at or near the old ratio. Again, by making silver mining unprofitable, or nearly so, miners all over the world have turned their attention to gold, and are producing it in such enormous quantities that its purchasing power is declining. We cannot pay our debts in Asia with the yellow metal, and we can only sell a limited amount of our manufactures to the people of that continent, because wages there are so low that a man has to work a week to earn the price of a cotton shirt. That is largely the case because the Westerners have artificially depressed the commodity-value of the metal they employ as money.

In my opinion, the West will never return to free silver coinage, because it is rapidly approaching the point where the free coinage of gold will have to be stopped. Paper money, absolutely devoid of intrinsic value, and based wholly on confidence (national or international, and not individual), is the goal toward which civilization seems swiftly and inevitably tending. When that condition arrives, if silver, as a commodity, stands at its old ratio with gold, it will buy two and a half times as much Eastern raw material and labor as it does now, and will, by just so much, stave off the day when the West will be commercially overwhelmed by the yellow and brown man. But if by then it is still discredited here, nothing is more certain than that all manufacturing will have to succumb to the labor competition of the East.

THEO. F. VAN WAGENEN.

Zacatecas, Mexico, June 30.

Petroleum is being used in Alaska for fuel to such an extent as to seriously interfere with coal consumption. At the Treadwell group of mines petroleum was substituted for coal in 1908, and there was also an increase of petroleum-burning engines on Yukon river boats. The shipments of petroleum to Alaska in the year ending June 30, 1907, amounted to 117,696 bbl.; in the succeeding 12 months they increased to 285,642 barrels.

BEAR RIVER DISTRICT.

Written for the MINING AND SCIENTIFIC PRESS
By W. W. RUSH.

The Bear River mining district, situated at the head of Portland canal, British Columbia, occupies a strip of land about 25 miles long by 5 wide, drained by Bear river. The country is rugged, and but for its proximity to tide-water would be difficult of access. As usual, the Provincial Government is rendering substantial assistance in opening the country. Bear river has been spanned by a 1400-ft. bridge, and

This district lies on the eastern flank of the Coast Range granites, and the mineral deposits occur for the most part in slates, quartzites, and silicious limestones. These latter rocks are often schistose, but the schistosity is not so general or so marked as on the western flank of the granite. Many varieties of igneous rocks occur, but their relation to the ore deposits has not been worked out. No fossils have been found, and any statement made hitherto in regard to the age of mineral deposits is merely speculative. No professional geologist has examined the country thus far, but R. W. Brock, Director of the Canadian Geological Survey, is expected to visit the camp this summer.

Taken as a whole, Bear River is a silver-lead district, but copper and gold are also found in paying quantities. The Red Cliff, situated on American creek, 15 miles up Bear river, is a notable exception to the ordinary type of mineral deposit of the camp. This property presents features analogous to the famous Mt. Morgan mine. It is a big irregular deposit of iron and copper-iron sulphide, with primary gold. Five miles farther up American creek is the Stewart-Brightwell property, one of the first located in the district. Here is a big silicious outcrop containing native silver and silver as chloride, and in combination with sulphur. The absence of pyrite and iron-stains is noticeable. By far the greatest amount of prospecting and development has been done on Glacier creek, from 6 to 10 miles from tidewater. Practically all of the creek is staked, and there are few claims without well defined quartz lodes and some ore. On this creek is a series of blanket veins following parallel bands of slate. Pyrite, galena, zinc-blende, chalcopryite, argentite, and native silver are present in a gangue of quartz. Varying amounts of gold are also found. Other veins cut the formation at various angles, and contain silver associated with pyrite, arsenopyrite, blende, galena, stibnite, and a dark sulphide of varying composition, usually called 'gray copper'. These minerals occur in a gangue of quartz, barite, and silicified rock. The Griffith-McGrath lode affords the most conspicuous example of the first-described class of veins. It is a strong vein, and very persistent in its strike. The Portland Canal Mining Co., operating on this vein, will spend



Map Showing Location of Portland Canal.

every year sees an extension of the system of roads and trails.

From Bear river a panoramic view of the country may be obtained. On either side rise precipitous walls of gray granite, iron-stained schists, or gentler slopes covered to an altitude of 3000 ft. with a thick growth of hemlock, spruce, and balsam. Snow and ice crown the higher peaks, and noisy torrents thread their sides with silver. Mines and prospects occur from sea-level to an altitude of 4000 ft. Owing to the moderate elevation, and the influence of the sea, the winters are probably less severe than in many mining districts of the States.

\$100,000 this summer in development and equipment, including an aerial tramway and concentrator.

The first prospecting of any consequence in the district was done in 1898 by a division of the army of gold-seekers which that year ascended every river and inlet of the Alaskan and British Columbian coast. Placer gold in paying quantities was not found, but interest in the base-metal deposits was aroused, and the first lode-locations were made. In 1905 many prospectors were attracted to the district by reports of the Stewart-Brightwell discovery, and as a result of their explorations Glacier creek was opened up.

PETROLEUM FIELDS OF ILLINOIS.

Written for the MINING AND SCIENTIFIC PRESS
By H. FOSTER BAIN.

Since June 1905 Illinois has produced approximately 85,000,000 bbl. of petroleum, and current production amounts to over a quarter of a million barrels per month. Prior to that date the State had been only an insignificant and infrequent producer. Following each of the great Eastern oil excitements, 'wild-cat' wells had been put down, and limited amounts of gas and oil had been found at a number of points. Near Litchfield, in Montgomery county, a small field was developed in 1886 and continued producing up to 1902, with a total output of 6000 bbl. At Sparta, in Randolph county, gas was found in 1888, and was used for some years. By 1904, however, production ceased, and when J. J. Hoblitzel began drilling near the old gas wells struck in 1865



Eastern Illinois Oilfield.

in Clark county, it was the general opinion that Illinois was 'not in the oil belt'. His success near Casey led to rapid development through Clark, Cumberland, Coles, Crawford, and Lawrence counties, and in a remarkably short time after shipments began, one of the world's great oilfields was outlined.

The productive territory as now known extends from Westfield, in Clark county, approximately 80 miles in a direction a little east of south, and averages from 10 to 16 miles in width. The field is in southeastern Illinois, and the main production comes from Clark, Crawford, and Lawrence counties, the three shaded on the accompanying map. On the larger map the productive territory is shown in greater detail.

Some eight or ten separate pools are recognized. At the extreme north of the field, extending from Westfield to Oilfield, is the first pool discovered. Connected with it geographically, and extending south about six miles, is the Casey township or Martinsville pool, which in turn connects with the John-

son township pool to the south. Detached and extending to the west in Cumberland county is the Siggins pool. In Crawford county, west of Robinson, is the extensive Robinson or Oblong pool. Southeast of Duncanville is a small pool taking its name from this town. Southwest of Flat Rock is the Honey Creek pool, while southeast of the same town is the Birds pool. In Lawrence county there is the big Bridgeport pool, though here, as in several of the others, different sands are recognized in various parts of the area.

The depth of the wells generally increases consistently from north to south. In the Oilfield pool the sand lies 300 to 350 ft. below the surface. In the Siggins pool there are two sands found approximately 400 and 570 ft., respectively, in depth. In Johnson township, again, there are two sands, lying 470 and 610 ft. below the surface. In Crawford county there seems to be a group of sands lying 900 to 1000 ft. deep. Frequently two are developed in one hole. In Lawrence county there are three sands, the Bridgeport of 950, the Buchanan at 1300, and the Kirkwood at 1500 ft. The country is very flat, so that while the topography affects the depths slightly, the main differences are due to structural features of the rock.

All of the oil comes from Carboniferous formations. With the exception of the Kirkwood, which is found in the Chester formation of the Mississippian, the sands occur in the Pennsylvania rocks. The latter have not yet been studied in Illinois in sufficient detail to permit of the series being broken up into formations which may be certainly correlated from place to place. It is known that at the base of the series is a variable thickness of Pottsville rocks, mainly conglomerates, sandstones, and sandy shales. In this division the Buchanan sand occurs. The Bridgeport, Robinson, and Duncanville sands, all lying at about the same horizon, belong either in the top of the Pottsville or the base of the overlying coal measures. Owing to imperfections of data, it is impossible as yet to make certain to which they should be referred. The remaining sands are all in the coal measures, presumably not extending far into the upper division. In the southern pools, higher sands, corresponding at least approximately to the productive sands of the northern pools, are frequently discovered. They often show small amounts of gas, but very little oil. In the northern district a few deep holes have been put down, and some at least are reliably reported to have yielded a little oil. Deep exploration has not, however, been systematic, and most of the results have been unfavorable. Sufficient data are not at hand to trace northward the deeper productive sands.

The field is situated along the line of strike of the La Salle anticline, a marked feature of the geological structure of the State. The productive pools are all under this upward bend of the strata, but the arch here is broad and low, and local distribution of dry and productive territory is erratic. To some extent the occurrence of the oil seems to be controlled by minor arches, but porosity of rock and irregular distribution of salt water evidently enter into the problem also. Pending the completion of detailed studies now being made by the State Geological Survey, it

is impossible to give a complete explanation of the occurrence of the oil.

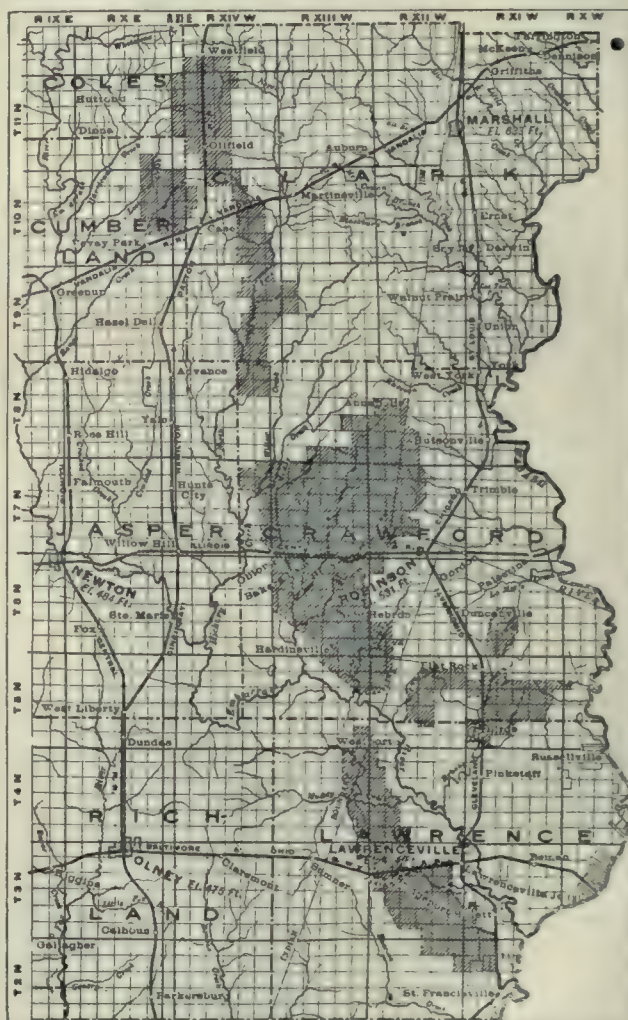
The amount of gas found is not large. In general it has not been more than enough to do the work of drilling and pumping and supply the farmers and local towns. Between the Flat Rock and Honey Creek oil pools, good gas wells occur, and show 80 lb. pressure after two years use. The gas from this field is piped north and south, but west of that place gas occurs with the oil, and is commonly wasted.

Outside of southeastern Illinois, and excluding gas found in the drift, petroleum and natural gas have been noted at a number of points in the State. On the west, from Sparta in Randolph to Litchfield in Montgomery county, both gas and oil have been found. From Sparta oil is now shipped in small quantities. Traces of oil have been found at Shipman, Smithton, Hillsboro, and other points. In this territory there is a pronounced erosion unconformity, both the Pottsville and Chester being cut out over parts of the territory. These beds also become thin to the north, but all the oil so far found has been in them or in the coal measures, as in eastern Illinois. As they show the same lithology as in the latter area, and as there are anticlines in western as in eastern Illinois, these showings of gas and oil are considered to be significant of probably larger quantities to be found by further prospecting. In southern Illinois the rocks are much disturbed, faulting as well as folding being fairly widespread. For this reason the conditions are not considered equally favorable, though very little prospecting has been done in the beds most likely to be productive. Some small amounts of gas and oil have been found in the coal measures.

Outside the area covered by the Pennsylvania rocks little is known of the possible presence of gas and oil. Neither has been found in the Mississippian below the Chester. The Devonian is not widespread in Illinois, and shows no evidence of the presence of either. The Niagara and the Galena-Trenton are widely present, are coarse thick dolomites, well adapted to the storage of petroleum, are covered by suitable shales, and both show more or less oil seepage where they outcrop. In addition, there is a small but attractive gas-field in Pike county, where the Niagara is brought near the surface by a minor anticline. In La Salle county a small amount of gas has been obtained from the Trenton. In the drift, gas is obtained at a number of points. While these wells seem, in certain cases at least, to derive their supply from decaying vegetation in the drift, the hypothesis of leakage from lower reservoirs cannot be entirely excluded. An interesting feature of these wells is the occasional finding of one which yields nitrogen instead of the ordinary combustible gas.

In contrast with the oil territory of California, with its mountains and rocky bluffs, Illinois is a flat, drift-covered plain. The rocks outcrop at only a few points. The geology can only be learned by study of drill records. On this account the first prospecting in each district is necessarily blind, but with the records now available, important aid may be derived from geology. In another particular also there is striking contrast. In Illinois there is no public land.

The country is all settled, and either cultivated or devoted to pasture. The oil-men deal entirely with individual owners, and oil-leases are private bargains. There are almost no special laws or regulations, as in the Western States. While some of the territory is developed by fee owners, it is in most cases leased from the owner for a term of five years, or as much longer as production continues. If the neighboring farms are untested, the owner usually gets from one-eighth to one-sixth of the oil as royalty. There is commonly an agreement that the drilling is to begin within a year or less, or that a stated rental per acre shall be paid till the first well is drilled. The land-owner retains all rights to the surface of the ground, except for the portion necessarily



Oil Pools in Eastern Illinois.

occupied by derricks, power-houses, and ordinary storage-tanks. If large storage is to be provided, it is customary to buy the land for the tank-farm outright. The local courts have interpreted rather strictly what surface land is necessary to production, but in many cases, since for agricultural purposes the land is only worth approximately \$30 per acre, much of the surface lies idle during production, and the oil-men use as much as they like. On a farm of 80 acres not more than 5 is necessarily kept from cultivation.

If oil has already been found on adjacent territory, a bonus is in order, and the farmer receives from \$30 to \$200 per acre in addition to the royalty and his reservation of the fee. When oil is developed the lease becomes the most valuable part of the oil

property, and is often sold. The price realized depends on many factors, but mainly upon the number of wells producing and on their average daily yield. There is a steady market for producing leases, and much trading even in those which are unproductive.

Wells are put down 400 to 600 ft. apart, beginning usually 200 ft. back from the boundary line. A well

of companies. Development has from the first been in the hands of experienced and capable oil-men, and the work has been done with that quiet efficiency which it is the joy of technical men to see.

The wells are not large, as judged by Western standards. In 1908, 3574 wells were completed, of which 555 were dry holes. The new production is given as 77,413 bbl. The Casey pool, after four years production, yields approximately 6 bbl. per well. The Crawford county wells, at the beginning of the fourth year of production, are yielding about 20 bbl. each. The Lawrence county wells are most productive, and give an average of about 40 barrels.

The amount won per acre is variable. Some of the territory has yielded 4000 bbl., and is still producing. Other wells, which looked equally good when bought, yielded only 500 bbl. per acre. One tract produced 8000 bbl. per acre, and from another tract of 20 acres over a million barrels of oil were taken. The last was only possible because the owner built his own storage-tanks and pumped constantly. Since the pipe-lines are only able to take from 50 to 75% of the oil offered at any one time, it is evident that this

understood rule requires immediate drilling when oil is struck on adjacent territory, and any attempt to drill close to the line is promptly met by competing wells just over the fence. As a result, this 'bucking the line' is unprofitable, and is considered distinctly bad form by all good oil-men. A common arrangement provides for 14 wells on 80 acres, protecting all sides and leaving 920 ft. clear in the centre.

Ordinary standard rigs are now used in drilling, though many of the shallow wells in the northern part of the field were put down with masts. The rigs are built 72 ft. high. The wells are cased and shot, and are provided with the usual 250-bbl. wooden storage tanks, as many as the operator can afford. They are pumped by jacks operated by gas-engines. From a dozen to 30 wells are connected by rods to a single engine, and one pump-man cares for the lease. The cost of production is small, and the cost of drilling has also been unusually low. In Clark county wells were put down for as little as \$1000. In Crawford the cost ran up to \$2500 to \$3000, and in Lawrence the deeper wells (1800 to 2000 ft.) cost approximately \$5000 each. Many wells have flowed enough oil to pay for themselves by the time they are connected with field lines, and in general the field has been one where many men have made money and few have lost. It has been fortunate in that there was never a 'boom', with the corresponding flotation of stocks by men experienced only in the promotion

enterprising gentleman got some oil which would have gone to his neighbors had they been similarly provided with storage.

The Ohio Oil Co., with F. G. Hillman manager and J. F. Kerr superintendent, represents the Standard,



Standard Rig for Drilling.

By courtesy of the State Geological Survey.



Jacks for Pumping.

By courtesy of the State Geological Survey.

and buys over 90% of the oil. It also owns and operates leases, and is a steady buyer of producing territory. How much of the production comes from its own leases is not known, but certainly less than half. Four pipe-lines to the East, and one to Alton, on the Mississippi, with storage tanks for over 25,000,000 bbl., have been built, in an effort to take care of the production. Even at this it has never been possible

for more than two weeks to take all the oil offered. In pro-rating, the company treats its own leases exactly as it does those of its competitors. Outsiders claim that its continued drilling compels them to bring in new wells in self-defense, and the reverse claim is made by the company. Probably human nature keeps both at work.

Within the field the oil is collected by a gravity system built by E. C. Bolton, chief engineer, with pumping stations at Oblong, Bridgeport, and Martinsville. The oil is pumped at 600-lb. pressure, and goes from Martinsville to Alton without relays. The oil is not as viscous as that produced in California, and an 8-in. line handles about 300 bbl. per hour. This amount can be increased by adding to the pumping plant, and varies about 10% with the seasonal changes of temperature. In 1908 the pipe-line runs of this company amounted to 31,972,630 barrels.

In the same period independent refiners shipped 1,523,648 bbl. Up to the present the independents have been forced to rely on tank-cars for shipments, or to sell to the Standard. Most of them have preferred the latter plan. The Tidewater Oil Co., however, has recently built a 6-in. line into the field, and it is estimated now that the independents are handling 10,000 to 15,000 bbl., and that they may be able to care for 25,000 bbl. per day by the close of the year. The Pure Oil Co., which is a large producer in this field, is said to have bought right of way for a second independent pipe-line. The Indian Oil Refining Co. has 500 tank-cars and 30 distributing stations, with refineries at Georgetown, Ky.; Lawrenceville and East St. Louis, Ill.; with a combined capacity of 6000 bbl. per day. The Sun Oil Co. ships by tank-cars, selling its oil for fuel. The Central Oil Co. maintains a refinery at St. Louis, Mo., while the Cornplanter and the Robinson Oil Refining Co. maintain small plants in the district.

While the independent refiners are undoubtedly doing well, the Ohio still dominates the field, and in June reported pipe-line runs of 2,365,956 barrels.

The oil ordinarily runs from 30 to 35° B. That from the Duncanville pool is 22 to 23° B, and is sold only for fuel. Aside from this, little oil is sold except to the refineries. In the surrounding territory coal is cheap and abundant, so that it is not necessary to sacrifice the oil by using it under boilers. The oil is low in sulphur, and sells at 68c. for that above 30° B gravity, and 60c. for that below. At these figures there has been a large profit, and the owners of 'crayfish land' elsewhere in the Mississippi Valley will extend a warm welcome to anyone desiring to locate further 'wild-cats'.

Oil is found for a distance of 250 miles on the eastern coast of Saghalin, but it is yet to be proved whether or not this oil belt can be developed so as to be of commercial value. As the oil is found so near the seacoast, it could readily be transported. It should therefore be an inviting field for development, and if all the rumors are to be believed, great activity in such development will be shown during the coming spring and summer.

Tin is being developed at Hainan in China.

FAIRBANKS GOLD REGION, ALASKA.

The decrease in the production of gold in Alaska in 1907 and 1908 does not mean, in the opinion of the United States Geological Survey, that the gold of the region is approaching exhaustion. It resulted partly from labor troubles and partly from lack of water for gold washing. Despite these drawbacks, the Fairbanks region, which produces nearly half of all the gold of Alaska, yielded about \$9,200,000—slightly in excess of its former maximum output. The region has progressed materially, and preparation has been made insuring a large production in the near future. The Tanana Valley railway, a narrow-gauge road about 50 miles long, was in 1907 finished to Chatanika, at the mouth of Cleary creek, and wagon-road improvement and construction had so far advanced by the close of the season of 1908 that heavy loads could be conveniently laid down at the workings on almost all the creeks of present importance. Through these means the high freight rates formerly prevalent have been reduced to a few cents per pound for summer freights to the most extreme points. The region has been in communication with the outside world by means of the Government telegraph system for several years, and during 1908 additional service was rendered available by the successful installation at Fairbanks of a wireless station operated by the Government. At Fairbanks foundries and machine shops, excellently equipped and under the direction of good mechanics, have been established. Much machinery especially adapted to the mining conditions prevailing in the district has been devised and entirely constructed in these local shops. Freight and passenger rates from Seattle to Fairbanks remain about the same, averaging in 1908 about \$75 per ton on ordinary supplies and \$125 to \$140 for first-class passengers.

An experiment in winter work promises very well for the future. The weather permits ordinary sluicing, at the most, for 150 days. An attempt at winter-slueicing was made, however, in 1907-8, on Esther creek, where water was warmed by the exhaust from the hoisting and pumping engines and pumped to the sluice-boxes. Sluicing was continued into January. As a result of this experiment several operators are preparing for winter sluicing during 1909.

Deep mining in Victoria involves attention to ventilation. In order to carry on economical mining it is necessary to have as large a volume of air circulating through the workings as possible. For instance, at 4254 ft. the rock temperature, 113.5°, and the water, at 114° F., requires a volume of natural air of not less than 10,000 cu. ft. per min. to maintain a temperature of 72 to 75°. The temperatures vary from summer to winter. In driving dead ends a system of overhead bratticing has been introduced to keep a current of air circulating to the face. A volume of 1250 cu. ft. is required in one mine to maintain a temperature of 86°. This system is the best yet developed for deep ground. Blowers have been tried, with poor results, the ground being so hot the pipes acted as conductors and made the air too hot in a distance of 400 ft. They have been found to heat the air 10 degrees.

VELOCITY OF FLOW OF WATER IN PIPES.

Written for the MINING AND SCIENTIFIC PRESS
By LEONARD M. GREEN.

The velocity of flow of water in a pipe under a given head may be quite closely calculated by a formula, when the pipe is of considerable length, but the available formulae do not give satisfactory results when the pipe is short and when the entry-head has to be taken into account. If there were no friction in the pipes, and no loss of head due to entry, then the velocity of flow in feet per second would be $\sqrt{2gh}$, where g is the acceleration in feet per second, due to gravity, namely, 32.16, and h is the total head in feet of water producing the flow.

The velocity of flow from a plain circular orifice is only about 62% of the theoretical velocity, namely, $0.62 \sqrt{2gh}$, and it therefore corresponds to a theoretical head of

$$\left(\frac{0.62 \sqrt{2gh}}{2g} \right)^2 = 0.385 h.$$

The loss of head due to entry is therefore 0.615 h , or 61.5%. By attaching a short piece of circular pipe equal in length to twice the diameter of the orifice, and of a diameter equal to the orifice (a cylindrical nozzle), the velocity of outflow may be increased to 82% of the theoretical, that is, to $0.82 \sqrt{2gh}$. This corresponds to a theoretical head of $\left(\frac{0.82 \sqrt{2gh}}{2g} \right)^2 = 0.672 h$. In this case, therefore, the loss of head due to entry is 0.328 h , or 32.8%. In most cases of flow of water in pipes the loss of head may be considered as being due to the entry-loss caused by a cylindrical nozzle such as that above mentioned, plus the loss occasioned by an additional length of pipe, the total head being the difference of level between the upper surface of the water in the vessel from which the flow takes place, and the level at which the water is discharged. If the flow be caused by pressure, the head in feet of water is equivalent to the pressure in pounds per square inch $\times 2.309$. The actual velocity is therefore that which would be theoretically produced by a head equal to the total head minus the friction-head caused by the total length of pipe, less a length equal to twice the diameter, minus the head lost by entry, including a length of pipe equal to twice the diameter.

Let v feet per second equal the actual velocity produced by a total head of h feet in a pipe of a diameter d inches, and of a length of 1 foot. Let F equal the friction-head per foot of pipe at the velocity of v feet per second.

Let l_e equal the number of feet of pipe of a diameter d inches, producing a friction-head equivalent to the entry-head when the velocity is v feet per second.

Then the theoretical head-producing flow equals total head minus pipe friction-head minus entry-head. This is equal to

$$h - F \left\{ \left(1 - \frac{d}{8} \right) + l_e \right\}$$

and therefore the actual velocity v equals

$$\sqrt{2g \left[h - F \left\{ \left(1 - \frac{d}{8} \right) + l_e \right\} \right]} \quad \text{Equation 1.}$$

Let f equal the friction-head per foot of pipe of 1 in. diam. at a velocity of 1 ft. per second. Then,

since the friction is proportional to the square of the velocity, the friction-head per foot of 1 in. diam. pipe at a velocity of v feet per second is $v^2 f$. For any other diameter the friction-head per foot of length will vary as some function of the diameter. In tables published by the Pelton Water Wheel Co., based on Cox's formula, the friction-head varies inversely as the diameter, but it would seem more probable that it should vary inversely as some power of the diameter greater than 1, and the results of Ellis and Howland's experiments, and the friction-heads as calculated from D'Arcy's formula for rate of flow, show that this is the case. The friction-heads per foot of pipe at a velocity of 2 ft. per second for pipes of various diameters as given by Ellis and Howland, Cox, and D'Arcy are shown below, and the results have been averaged.

| Diameters of pipe in inches. | | | | | | |
|--------------------------------|--------|---------|---------|---------|----------|----------|
| 0.5 | 1 | 3 | 6 | 12 | 24 | 48 |
| Velocities in feet per second. | | | | | | |
| ..... | About | 0.0097 | 0.0032 | 0.0015 | 0.00065 | 0.00030 |
| ..... | 0.0350 | 0.00791 | 0.00395 | 0.00198 | 0.00098 | ..... |
| 0.0854 | 0.0297 | 0.0066 | 0.00286 | 0.00136 | 0.00065 | 0.00031 |
| 0.0854 | 0.0295 | 0.00807 | 0.00334 | 0.00161 | 0.00076 | 0.000305 |
| $\frac{1}{d^{1.2}}$ | | | | | | |
| 0.0730 | 0.0317 | 0.00848 | 0.00369 | 0.00162 | 0.000702 | 0.000305 |

If the friction head for the 48-in. pipe at a velocity of 2 ft. per second be taken as 0.000305, and the head be made to vary as $\frac{1}{d^{1.2}}$ where d is the diameter of the pipe, a set of figures is obtained which agrees fairly well with the average. Corrected for a velocity of 1 ft. per second, the figures for the friction-head are:

| 0.5 in. | 1 | 3 | 6 | 12 | 24 | 48 |
|---------|--------|---------|---------|---------|----------|----------|
| 0.0182 | 0.0079 | 0.00212 | 0.00092 | 0.00040 | 0.000175 | 0.000076 |

Therefore f (the friction-head of 1 ft. of 1-in. pipe at a velocity of 1 ft. per second) may be taken as 0.0079.

$$\text{Then } F \text{ (in Equation 1)} = \frac{f v^2}{d^{1.2}} = \frac{0.0079 v^2}{d^{1.2}}$$

The value of f , 0.0079, is for clean cast-iron pipes; for other materials it would of course vary according to the rugosity of the surface.

To find the entry-head, we here consider it to be that due to a short cylindrical pipe or nozzle in length twice its diameter. It has an ordinary plain straight-cut entry to the reservoir, and is not flared or rounded. For simplicity the head may be taken as being equivalent to a certain number of feet of pipe. For a 1 in. diam. pipe of 2-in. length the velocity of flow due to a head of h feet will be 82% of $\sqrt{2gh} = 6.576 \sqrt{h}$ ft. per second. This is theoretically due to a head of $\frac{(6.576)^2 h}{64.32}$ feet, or to 0.6724 h feet. The loss of head due to entry is therefore 0.3276 h feet. This would be equivalent to the friction-head produced by $\frac{0.3276 h}{f}$ feet of pipe at a velocity of 1 ft. per second, but as the velocity is $6.576 \sqrt{h}$ feet per second, it is actually equivalent to $\frac{0.3276 h}{f} \times \frac{1}{(6.576 \sqrt{h})^2}$ feet of pipe = $\frac{0.00757}{f}$ feet of pipe.

For pipe of any other diameter d it will be equivalent to $\frac{0.00757 d^{1.2}}{f}$ feet of pipe.

$$\text{Therefore } l_e \text{, in Equation 1,} = \frac{0.00757 d^{1.2}}{f}$$

For clean cast-iron pipes, $f = 0.0079$, so that the

entry-head is equivalent to 0.96 ft. of pipe of 1 in. diam., or $0.96 \times d^{1.2}$ feet of pipe of diameter d.

Substituting the values of $F \left(\frac{f v^2}{d^{1.2}} \right)$ and of $l_e \left(\frac{0.00757 d^{1.2}}{f} \right)$ in Equation 1, we obtain

$$v = \sqrt{2gh - 2g \frac{f v^2}{d^{1.2}} \left\{ \left(1 - \frac{d}{6}\right) + \frac{0.00757 d^{1.2}}{f} \right\}}$$

Therefore

$$v^2 = 2gh - v^2 \left\{ \frac{2gf \left(1 - \frac{d}{6}\right) + 2g \times 0.00757 d^{1.2}}{d^{1.2}} \right\}$$

$$v^2 = \frac{2gh d^{1.2}}{d^{1.2} + 2gf \left(1 - \frac{d}{6}\right) + 2g \times 0.00757 d^{1.2}}$$

or
$$v = \sqrt{\frac{64.32 h d^{1.2}}{1.487 d^{1.2} + 64.32 f \left(1 - \frac{d}{6}\right)}} \qquad \text{Equation 2.}$$

For clean cast-iron pipes, $f = 0.0079$,

so that
$$v = \sqrt{\frac{64.32 h d^{1.2}}{1.487 d^{1.2} + 0.508 \left(1 - \frac{d}{6}\right)}}$$

The above formula may be used for any length of pipe and for any head. The results obtained by this formula on some sizes of pipes with different heads are compared in the following table with those calculated by D'Arcy and Cox's formulae, and with some figures given by Kuichling. The latter figures are given for pipes of nominal diametres; the other columns are for actual diametres.

| | | Velocity in feet per second— | | | | |
|-----------------------|---------------------------|------------------------------|--------|-------|-----------|---|
| Diameter pipe, inches | Head, feet | Length, feet | D'Arcy | Cox | Kuichling | Actual velocity |
| | | | | | | from pipe of length twice the diameter. |
| 0.5 | 10 | 0.083 | ..... | ..... | ..... | 20.8 |
| | | 10 | 6.82 | 11.66 | ..... | 7.0 |
| | | 35 | 3.65 | 5.98 | ..... | 3.90 |
| | | 100 | 2.16 | 3.36 | ..... | 2.33 |
| | | 1000 | 0.682 | 0.90 | ..... | 0.74 |
| | | 10000 | 0.216 | ..... | ..... | 0.234 |
| | 69.28 (30 up per sq. in.) | 0.083 | ..... | ..... | ..... | 54.8 |
| | | 10 | ..... | ..... | ..... | 18.4 |
| | | 35 | ..... | 16.64 | 13.5 | 10.25 |
| | | 69.28 | 6.82 | 11.66 | ..... | 7.34 |
| | | 100 | 5.68 | 9.61 | 8.1 | 6.13 |
| 1 | 10 | 0.166 | ..... | ..... | ..... | 20.8 |
| | | 10 | 11.60 | 16.80 | ..... | 9.95 |
| | | 35 | 6.21 | 8.70 | ..... | 5.78 |
| | | 100 | 3.67 | 4.94 | ..... | 2.52 |
| | | 1000 | 1.16 | 1.35 | ..... | 1.12 |
| | | 10000 | 0.367 | ..... | ..... | 0.356 |
| | 69.28 | 0.166 | ..... | ..... | ..... | 54.8 |
| | | 10 | ..... | ..... | ..... | 26.3 |
| | | 35 | ..... | 24 | 18.7 | 15.2 |
| | | 69.28 | 11.60 | 16.8 | ..... | 11.0 |
| | | 100 | 9.65 | 13.82 | 11.6 | 9.25 |
| 3 | 10 | 0.5 | ..... | ..... | ..... | 20.8 |
| | | 10 | 24.6 | ..... | ..... | 15.2 |
| | | 35 | 13.16 | 15.45 | ..... | 10.2 |
| | | 100 | 7.78 | 8.92 | ..... | 6.55 |
| | | 1000 | 2.46 | 2.52 | ..... | 2.16 |
| | | 10000 | 0.778 | ..... | ..... | 0.69 |
| | 69.28 | 0.5 | ..... | ..... | ..... | 54.8 |
| | | 10 | ..... | ..... | ..... | 40.1 |
| | | 35 | ..... | ..... | 30.0 | 25.8 |
| | | 69.28 | 24.60 | ..... | ..... | 20.2 |
| | | 100 | 20.45 | 25 | 19.8 | 17.20 |
| 6 | 10 | 1 | ..... | ..... | ..... | 20.8 |
| | | 10 | 37.20 | ..... | ..... | 17.8 |
| | | 35 | 19.90 | 22.2 | ..... | 13.4 |
| | | 100 | 11.78 | 12.83 | ..... | 9.30 |
| | | 1000 | 3.72 | 3.73 | ..... | 3.24 |
| | | 10000 | 1.18 | 1.01 | ..... | 1.036 |
| | 69.28 | 1 | ..... | ..... | ..... | 54.8 |
| | | 10 | ..... | ..... | ..... | 46.9 |
| | | 35 | ..... | ..... | 37.7 | 35.2 |
| | | 69.28 | 37.2 | ..... | ..... | 28.5 |
| | | 100 | 31.0 | ..... | 27.0 | 24.45 |
| 12 | 10 | 2 | ..... | ..... | ..... | 20.8 |
| | | 10 | 54.7 | ..... | ..... | 19.45 |
| | | 35 | 28.25 | ..... | ..... | 16.55 |
| | | 100 | 17.30 | 18.37 | ..... | 12.64 |
| | | 1000 | 5.47 | 5.45 | ..... | 4.85 |
| | | 10000 | 1.73 | 1.49 | ..... | 1.57 |
| | 69.28 | 2 | ..... | ..... | ..... | 54.8 |
| | | 10 | ..... | ..... | ..... | 51.4 |
| | | 35 | ..... | ..... | ..... | 43.6 |
| | | 69.28 | 54.7 | ..... | ..... | 37.1 |
| | | 100 | 45.5 | ..... | ..... | 33.25 |

| | | | | | | | |
|-------|----|-------|-------|-------|-------|-------|-------|
| 24 | 10 | 2 | ..... | ..... | ..... | 54.8 | 54.8 |
| | | 10 | ..... | ..... | ..... | ..... | 51.4 |
| | | 35 | ..... | ..... | ..... | ..... | 43.6 |
| | | 69.28 | 54.7 | ..... | ..... | ..... | 37.1 |
| | | 100 | 45.5 | ..... | ..... | ..... | 33.25 |
| 48 | 10 | 1000 | 14.4 | 15.21 | ..... | ..... | 12.72 |
| | | 10000 | 4.55 | 4.46 | ..... | ..... | 4.13 |
| | | 2 | ..... | ..... | ..... | 20.8 | 20.8 |
| | | 10 | 78.8 | ..... | ..... | ..... | 20.3 |
| | | 35 | 42.1 | ..... | ..... | ..... | 18.65 |
| 69.28 | 4 | 100 | 24.9 | ..... | ..... | ..... | 15.80 |
| | | 1000 | 7.88 | 7.91 | ..... | ..... | 7.12 |
| | | 10000 | 2.49 | 2.22 | ..... | ..... | 2.38 |
| | | 2 | ..... | ..... | ..... | 54.8 | 54.8 |
| | | 10 | ..... | ..... | ..... | ..... | 53.5 |
| 48 | 10 | 35 | ..... | ..... | ..... | ..... | 49.1 |
| | | 69.28 | 78.8 | ..... | ..... | ..... | 44.7 |
| | | 100 | 65.5 | ..... | ..... | ..... | 41.6 |
| | | 1000 | 20.7 | 21.71 | ..... | ..... | 18.7 |
| | | 10000 | 6.55 | 6.50 | ..... | ..... | 6.25 |
| 69.28 | 8 | 2 | ..... | ..... | ..... | 54.8 | 54.8 |
| | | 10 | ..... | ..... | ..... | ..... | 54.4 |
| | | 35 | ..... | ..... | ..... | ..... | 52.4 |
| | | 69.28 | 112.5 | ..... | ..... | ..... | 50.5 |
| | | 100 | 93.3 | ..... | ..... | ..... | 47.9 |
| 48 | 10 | 1000 | 29.5 | ..... | ..... | ..... | 26.6 |
| | | 10000 | 9.33 | 9.41 | ..... | ..... | 9.35 |
| | | 2 | ..... | ..... | ..... | 54.8 | 54.8 |
| | | 10 | ..... | ..... | ..... | ..... | 54.4 |
| | | 35 | ..... | ..... | ..... | ..... | 52.4 |

It will be noticed that for fairly short lengths of pipe the results given by D'Arcy's formula are much too high for the larger diameter pipes, being sometimes three or four times more than the maximum flow that can be obtained from the pipe. It is therefore evident that D'Arcy's formula can only be successfully used for considerable lengths of pipe, for short lengths give results which are entirely misleading. The same applies to Cox's formula. The proposed formula, on the other hand, gives results which are apparently approximately correct for the flow of water in pipes of any diameter and under any variations of length and head, with the exception, of course, of the flow in capillary tubes. For pipes of other material than cast-iron the factor f (0.0079) must of course be altered to suit the rugosity of the surface. If the pipe where it enters the reservoir is cone-shaped or flared, the entry-head may be equivalent to as little as $\frac{0.00275}{f}$ feet of pipe. This causes the factor by which $d^{1.2}$ is multiplied in the denominator (namely, 1.487) to become 1.177. If the entry-head be entirely neglected the factor becomes 1.000. The value of $d^{1.2}$ for several diameters is given below. For any particular value of d the value of $d^{1.2}$ can be readily obtained from a table of logarithms.

| | | | | | | | | |
|-------------|-------|------|------|------|------|------|------|------|
| Diam. d in. | 0.5 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| $d^{1.2}$ | 0.435 | 1.0 | 2.3 | 3.74 | 5.29 | 6.90 | 8.59 | 10.3 |
| Diam. d in. | 8 | 9 | 10 | 11 | 12 | 24 | 48 | |
| $d^{1.2}$ | 12.2 | 14.0 | 15.9 | 17.8 | 19.6 | 45.2 | 104 | |

Coal was first noted in the Coos Bay region of Oregon about fifty years ago, J. S. Newberry having reported in 1855 that they had begun to attract attention. It is known that some mining was done there in 1855 and in 1872, and that in 1876 two mines—the Eastport and the Newport—were in active operation. The Newport mine, however, was the only one to survive. The Beaver Hill mine was opened in 1895 and is now one of the important producers. The first record of coal production from this field is contained in the census report of 1880, which shows that in that year 43,205 short tons were mined. The production has exceeded 100,000 tons in four years only—1896, 1897, 1904, and 1905—the maximum, in 1904, reaching 111,540 short tons. The total production to the close of 1908 has amounted to 1,876,651 short tons.

CYANIDATION OF SILVER ORES.

Written for the MINING AND SCIENTIFIC PRESS
By THEO. P. HOLT.

Since the publication of some laboratory experiments on the above problem in the MINING AND SCIENTIFIC PRESS of April 17, I have received a number of personal inquiries regarding the work, which would seem to warrant the submitting of more complete data. The general scope of the work, and also the method of conducting the tests, are discussed in the previous article. As far as practicable I have endeavored to secure uniform conditions in the experiments from which the graphs have been constructed. The required weight of the silver mineral was in each case crushed with a little quartz sand,

due to the power of BrCy as an oxidizer. The bromo-cyanide used in these experiments was made by adding liquid bromine to a 0.5% KCy solution. The solution was kept cold by surrounding the flask with snow. When all the potassium cyanide has been converted into bromo-cyanide a permanent yellow color appears. The strength of solution in BrCy is determined by titrating with a standard thio-sulphate solution. The absence of free cyanide may be assured by a drop of the silver nitrate standard.

A striking illustration of the difference of solubility of gold and silver in BrCy is presented by some results on sample No. 13 (see Fig. 5 and 6). This is a hard quartz-rhyolite from Mexico, assaying 1.29 oz. gold and 56.80 oz. silver. The silver is nearly all present as argentite. Although this ore contained

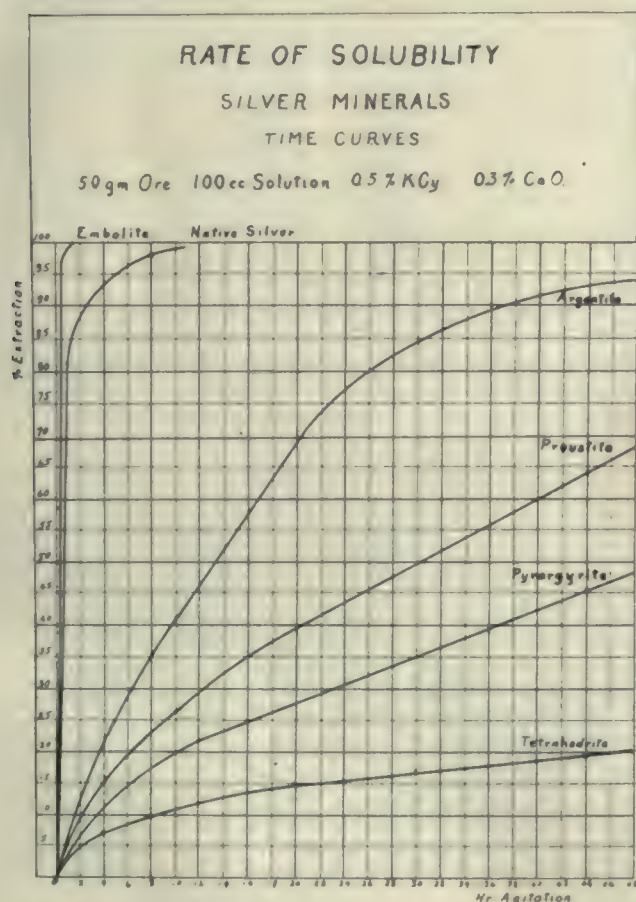


Fig. 1.

and passed frequently over a 100-mesh screen. It was then mixed with a sufficient quantity of pure quartz sand to make an 'ore' assaying approximately 50 oz. silver. This method of preparation favors the production of a large number of particles approaching the size of the maximum grain, which will in a measure offset the fact that none of the mineral is encased in the gangue. No doubt the surface of mineral exposed to the action of the cyanide solution is much less than obtains in modern slime-treatment practice.

Some statements have been made recently concerning the adaptation of bromo-cyanide to the treatment of silver ores. I find that in the absence of free cyanide it is not a solvent for the silver minerals. However, the addition of a limited quantity of bromo-cyanide to a cyanide solution is often quite efficient in increasing the extraction. This is doubtless largely

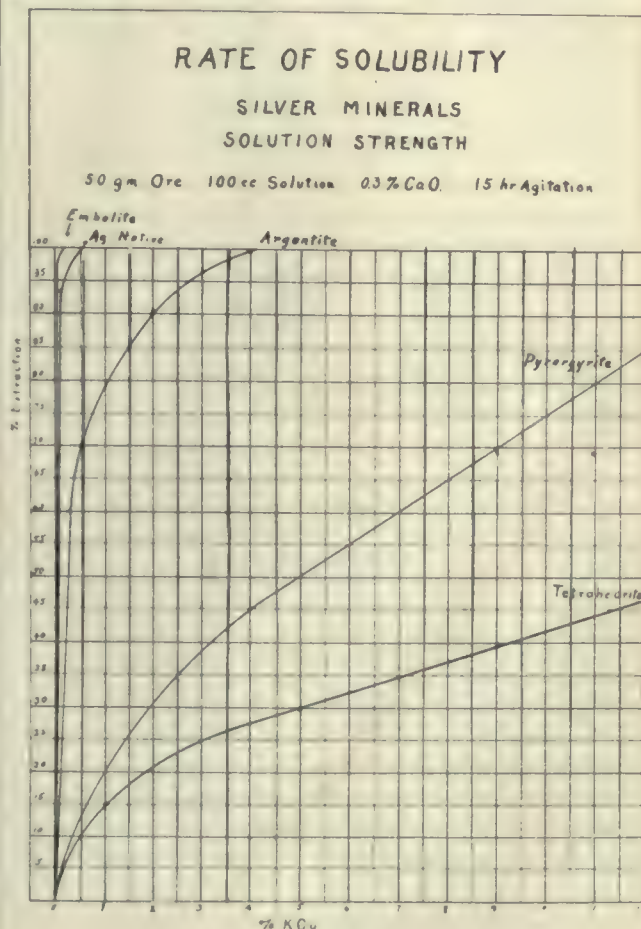


Fig. 2.

over forty times as much silver as gold, upon treatment with bromo-cyanide about one third of the gold passed into solution, while not so much as a trace of dissolved silver could be detected. It is also remarkable how closely its silver content follows the line for argentite through the variations in treatment.

With certain of the silver minerals a chloridizing roast seems the only means of securing a satisfactory extraction. The graphic results were obtained on small samples mixed with 5% salt and roasted in an open muffle for one hour. A similar sample, without the addition of salt, was roasted at the same time. The temperature was taken every 20 minutes, and averaged above 700° C. It is evident from the graphs that a chloridizing roast is about equally effective in all cases, the silver being converted into a chloride which is very readily dissolved. It is probable that both the amount of salt and the time of the roast

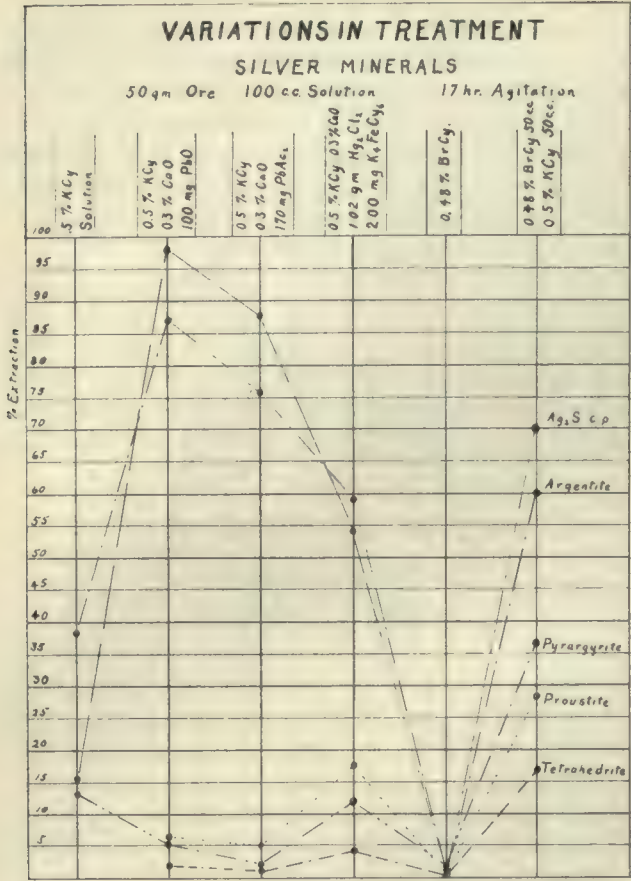


Fig. 3.

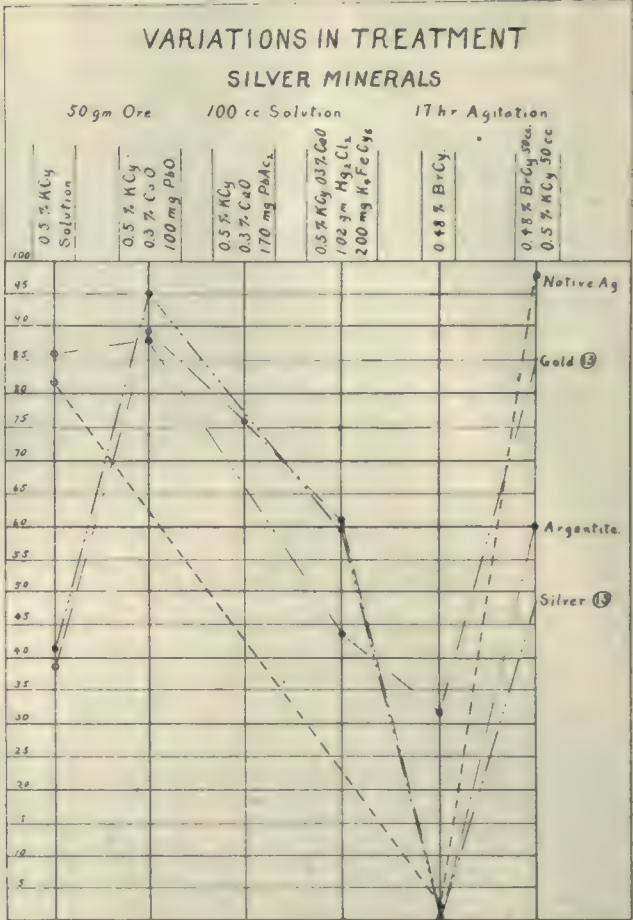


Fig. 5.

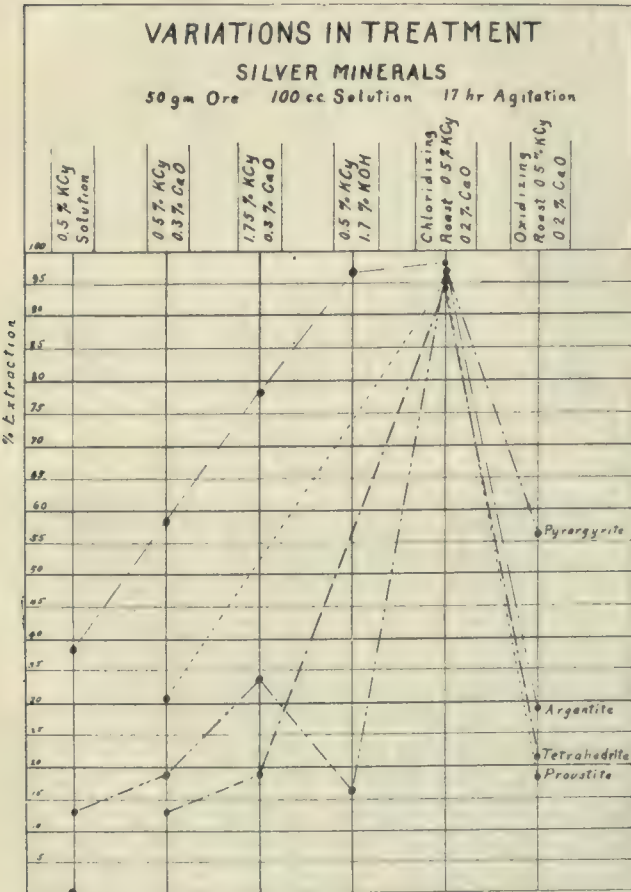


Fig. 4.

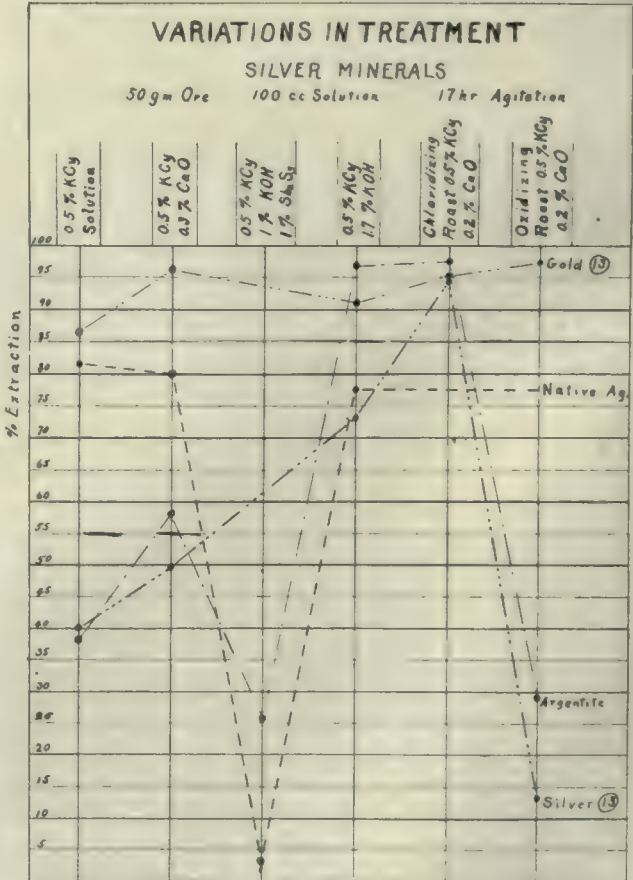


Fig. 6.

could be materially decreased without reducing the extraction. For an oxidizing roast one hour is too brief a period to materially change the state of the silver.

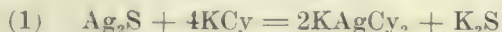
Variations in treatment reveal some remarkable contrasts in the action of native silver and argentite. Louis Janin, Jr., published the first experimental results on the solution of silver sulphide and cement-

silver in potassium cyanide.¹ He sums up this investigation by stating that "The extraction with silver sulphide is directly proportional to the strength of solution, and with cement-silver inversely proportional." With slight correction the data of his tables are given graphically in Fig. 8. A few years later these 'curious phenomena' were satisfactorily explained by J. S. MacLaurin when he established the fact that "The solubility of oxygen is greater in a weak than in a strong solution, and the amount of gold (or native silver) dissolved is proportional to the absorption coefficients of oxygen."²

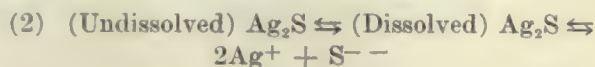
A clear knowledge of the fundamental laws of

case is high. The oxygen of the air may be replaced by the various oxidizers, or any electro-negative ion, as OH, Cl, or Br. Thorough aeration seems preferable to the introduction of special oxidizers.

The solution of argentite (Ag_2S) has been discussed recently by a number of writers in the MINING AND SCIENTIFIC PRESS. The primary reaction may be written:

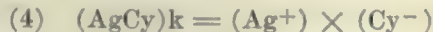


This equation is reversible and incomplete, and owing to the fact that Ag_2S is so slightly soluble, proceeds only to a limited extent before equilibrium becomes established. Unlike the case on native silver previously discussed, the formation of the complex AgCy_2 ion does not remove a sufficient number of the argent-ions to bring any considerable amount of the silver sulphide into solution. The ionic equilibrium existing in the above equation, as it effects silver sulphide, may be represented as follows:



According to the law of mass action, we can cause the above equation to pass in the desired direction by removing either the silver ion or the sulphur ion from the solution. Both methods are practicable.

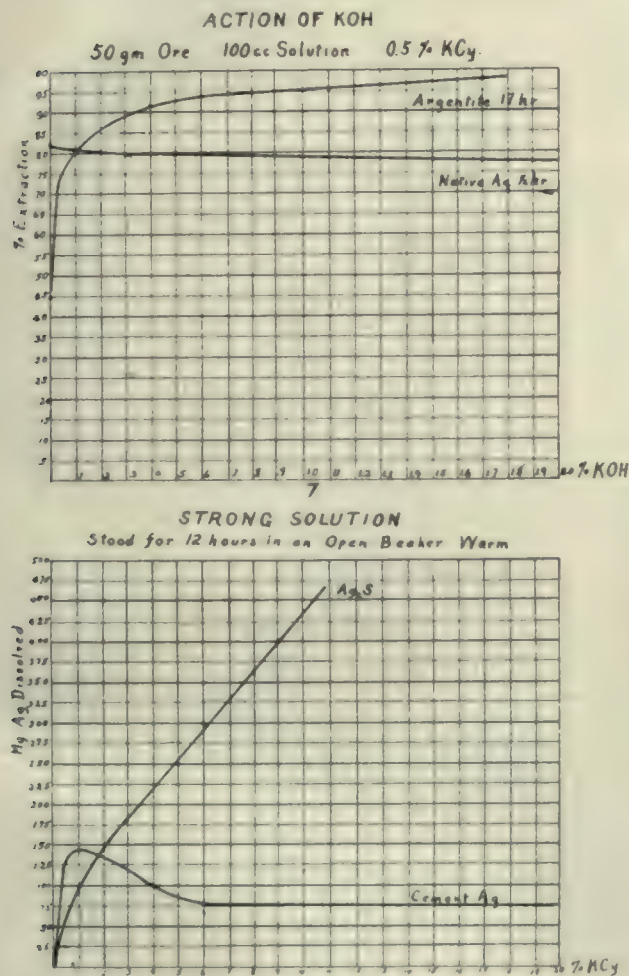
The silver ions present in a potassium argentocyanide solution are due to the third step in the dissociation of this salt.



If no other salt dissociating either Ag or Cy ions be present in the above solution, the number of these ions is equal; but suppose an excess of KCy is added to the above solution: the result then is that the equality of (3) is disturbed, since the number of Cy ions has been increased, and the silver ions must combine with Cy ions to form undissociated $\text{AgCy} \rightleftharpoons$. Thus the silver ions present may be reduced to an infinitesimal number, and the solution of silver sulphide be allowed to proceed. This end is realized in practice by the use of strong solutions.

The removal of sulphur ions resulting from the solution of silver sulphide and other sources, is brought about by oxidation and precipitation as insoluble sulphides. The degree to which chemical salts are capable of influencing the amount of silver dissolved may be appreciated when we inspect the graphic results of a few tests. (See Fig. 4, 5, 6, and 7.) Take the line for argentite as an example. The 0.5% KCy solution dissolves 38% in 17 hours. The addition of 0.3% lime brings this up to 58%. By making the solution strongly alkaline with KOH, almost 97% of the silver is dissolved in the same time. A small amount (0.2%) of litharge is about equally effective. Litharge (PbO), although it enters the solution as a plumbite, still dissociates a sufficient number of Pb ions to effectively remove the S ions as insoluble PbS . Thus the presence of lead salts prevents the equilibrium indicated above being established, and the solution of silver sulphide proceeds. Any metal, the sulphide of which is but slightly soluble in cyanide solution, will produce a similar effect.

The increased extraction observed on adding potas-



Figs. 7 and 8.

chemistry is essential to a correct interpretation of the experimental results. The theory involved in the solution of gold in potassium cyanide is discussed at length by S. B. Christy in his article on the 'Electromotive Force of the Metals.'³ A summary of these principles in their application to silver is roughly as follows: there are two forces tending to drive the metal into solution: (1) the electromotive force of the silver in a cyanide solution, and (2) the ionizing tendency of the oxygen present. The electromotive force of the metal is the difference between its 'solution pressure' and the 'osmotic pressure' of its ions already present in the solution. But since the compound KAgCy_2 in solution dissociates extremely few silver ions, the electromotive force of silver in this

¹Eng. & Min. Jour., Dec. 29, 1885

²Jour. Chem. Soc., Vol. 63, p. 724, and Vol. 67, p. 199.

³Trans. Amer. Inst. Min. Eng., Vol. 30, p. 864.

sium hydroxide to the solution is also in accordance with the mass law. In this case we have:



Upon adding a highly dissociated salt, as KOH, we greatly increase the number of K ions, and hence the product on the right of the equation. To establish ionic equilibrium some of the K ions must unite with S ions to form undissociated K_2S , and thus effectively removing S ions from the solution. From a practical standpoint the use of some metal to precipitate the sulphur in an insoluble form is much to be preferred, as any other method results in the fouling of the solution, by the accumulation of soluble sulphides.

I trust that this review of some of the fundamental principles of chemistry may be useful in the study of the experimental data. The reactions involved in most cases are complex, and only those which are quite elementary are indicated. I shall be pleased to receive suggestions or criticisms along the line of this work, and hope that further investigation may develop points of practical value for application in the process.

MINERALS IN URUGUAY.

In Uruguay, gold has been found in the Departments of Minas, Treinta y Tres, Montevideo, and Rivera, in placers and in quartz veins. There are but two mines operated to any extent, from which were produced in 1908, 20,514 tons, yielding 2709 oz. gold, valued at \$46,586. Coal is being mined in the Departments of Montevideo, Santa Lucia, and Cerro Largo, while peat exists in Maldonado and Montevideo. The Cerro Largo and Santa Lucia coal is of good quality and will soon be placed upon the local market. Petroleum is known to exist; antimony is found in Santa Lucia, Minas; graphite at Carrasco and Cerro, Montevideo, and at Arroyo Santa Lucia, Florida; copper-silver is found at Pan de Azúcar, in Maldonado; copper exists in Minas; iron ore in Pantanoso, Montevideo; Minas and Areicua, Rivera; and manganese in Rivera. To encourage and assist mining projects, all machinery, tools, and other articles necessary for investigating and operating mines and erecting metallurgical establishments are exempted from customs duties. There are good opportunities for investment in mining properties in Uruguay, the Government welcomes and protects such enterprise, and labor is cheap in the Departments where minerals abound.

Palladium is an article of commerce, though in extremely small quantities. The quantity of palladium imported in 1908 was but three one-hundredths of a pound. This small quantity was, however, valued at \$21, a pound therefore being worth approximately \$700. In other years the quantities imported have been much larger, amounting in 1905 to over \$10,000 in value, and in 1904 to more than \$16,000. This rare metal, associated with platinum, while found in its native state in small quantities in Germany and Brazil, is chiefly supplied from the working over of platiniferous residues of various mints, and is used in the manufacture of astronomical instruments, and by dentists, when alloyed with silver.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

J. J. M.: Cassiterite.

J. J. McS.: Cassiterite.

W. L. P., Ketchikan, Alaska: Barite.

B. C. M.: Quartz porphyry containing pyrite.

A. M., Hawthorne, Nevada: Calcite and graphite.

C. T., East Auburn, California: Fine-grained mica schist.

W. J. T., Seven Troughs, Nevada: Pyrrhotite and chalcopyrite.

C. V. D.: Altered biotite gneiss and light colored aplitic material.

E. J. S., La Palma, Sonora, Mexico: A fire clay, not very silicious.

L. N. W., Nevada City, California: Quartz and tale with a little pyrite.

G. H. N., Santa Cruz, California: No. 1, cinnabar in calcite; No. 2, cinnabar on an andesite.

J. A. R., Las Vegas, Nevada: Galena, malachite, pyromorphite, and no reaction for tungsten.

D. L., Pioche, Nevada: No. 1, indurated clay; No. 2, clay-shale; No. 3 calcite (limestone); No. 4, calcareous shale, with crystals of calcite.

I. M. K., Nelson, Nevada: No. 1, arsenopyrite, pyrite, and pyrite altered to hematite; No. 2, pyrite and fine grains of magnetite in calcite and quartz; No. 3, serpentine; No. 4, dacite, stained with hematite.

I. J. S., Silver City, New Mexico: No. 1, altered syenite; No. 2, syenite and pyrite; No. 3, biotite syenite discolored by hematite; No. 4, syenite discolored by hematite; No. 5, altered syenite; now largely an aggregate of kaolin and talc.

C. C. G., Ocotlán, Oaxaca, Mexico: No. 1, dacite, badly altered; specimen too small for accurate determination; No. 2, syenite and pyrite; No. 3, pyrite in quartz stained with hematite; No. 4, chalcopyrite, pyrite, and galena in quartz; No. 5, olivine diabase; No. 6, specular hematite; No. 7, altered dacite; No. 8, a vesicular lava, probably rhyolite, containing magnetite and limonite; No. 9, quartz in contact with altered syenite; No. 10, pyrite in decomposed basic rock, now mostly talc; No. 11, pyrite in quartz stained with hematite; No. 12, nepheline syenite; No. 13, galena and chalcopyrite; No. 14, granite or granodiorite; No. 15, aggregate of quartz and decomposed feldspar; No. 16, iron-stained quartz; matrix inadequate for determination; No. 17, syenite.

The tantalum of the Black Hills occurs in the mineral columbite. The known deposits of columbite in the region have been described in detail by F. L. Hess. Tantalum is used in making filaments for incandescent electric lamps.

COMPANY REPORTS.

AMERICAN SMELTING & REFINING.

The annual report of the American Smelting & Refining Co. for the fiscal year ended April 30, 1909, shows net, after all charges and dividends, a total of \$1,843,050, as compared with a surplus of only \$11,191 in the previous year:

| | 1909. | 1908. | 1907. | 1906. |
|-----------------------|-------------|-------------|--------------|--------------|
| Gross | \$9,146,387 | \$9,403,282 | \$13,250,058 | \$11,665,885 |
| Betterments | 797,072 | 933,129 | 976,534 | 828,582 |
| Balance | 8,349,315 | 8,470,153 | 12,273,524 | 10,837,303 |
| Interest, taxes, etc. | 637,334 | 836,866 | 763,854 | 675,945 |
| Net | 7,711,981 | 7,633,287 | 11,509,670 | 10,161,358 |
| Profit sharing fund | 47,695 | ..... | ..... | ..... |
| Net | 7,644,284 | 7,633,287 | 11,509,670 | 10,161,358 |
| Extra improvem'ts | 321,234 | 622,096 | *1,595,416 | *1,387,303 |
| Balance | 7,343,050 | 7,011,191 | 9,914,254 | 8,774,055 |
| Preferred dividend | 3,500,000 | 3,500,000 | 3,500,000 | 3,500,000 |
| Balance | 3,843,050 | 3,511,191 | 6,414,254 | 5,274,055 |
| Common dividend | 2,000,000 | 3,500,000 | 3,500,000 | 3,250,000 |
| Surplus | 1,843,050 | 11,191 | 2,914,254 | 2,024,055 |
| Previous surplus. | 13,408,218 | 13,397,028 | 10,482,775 | 8,458,720 |
| Total surplus.. | 15,251,268 | 13,408,219 | 13,397,029 | 10,482,775 |

*Does not include appropriation for metal stock account.

The general balance sheet on April 30, 1909, compares as follows:

| Assets: | 1909. | 1908. | 1907. | 1906. |
|--------------------|--------------|--------------|--------------|--------------|
| Prop'rty account | \$86,845,670 | \$86,845,670 | \$86,845,670 | \$86,845,670 |
| Investments ... | 3,949,957 | 3,950,087 | 3,810,595 | 4,179,914 |
| Metal on hand... | 17,592,192 | 17,519,663 | 18,251,587 | 19,415,200 |
| Material | 1,330,773 | 1,380,711 | 1,317,544 | 1,114,893 |
| Net current assets | 465,140 | 500,526 | ..... | ..... |
| Cash | 7,359,239 | 5,629,034 | 6,706,984 | 4,757,929 |
| Total | 117,542,973 | 115,825,724 | 116,932,380 | 116,313,606 |
| Liabilities: | | | | |
| Common stock.. | 50,000,000 | 50,000,000 | 50,000,000 | 50,000,000 |
| Preferred stock. | 50,000,000 | 50,000,000 | 50,000,000 | 50,000,000 |
| Bonds | 237,000 | 349,000 | 457,000 | 549,000 |
| Net current li- | | | | |
| abilities ..... | ..... | ..... | 439,051 | 2,380,966 |
| Unearned treat- | | | | |
| ment charges. | 2,054,705 | 2,068,505 | 2,639,301 | 2,920,865 |
| Profit and loss | | | | |
| surplus | 15,251,268 | 13,408,218 | 13,397,028 | 10,482,775 |
| Total | 117,542,973 | 115,825,724 | 116,932,380 | 116,313,606 |

Notwithstanding the depression in business operations during the period covered by this report, after paying quarterly dividends, amounting to 7% on the preferred stock and 4% on the common stock, there has been carried to surplus account for the year \$1,843,050. This increase of surplus is largely shown in the cash and demand loans, amounting to \$1,730,204. All expenditures on the plants on account of repairs and betterments, as well as improvements and new construction, have been charged to profit and loss account, and expenditure has been made to improve efficiency of the plants and their ability to operate economically. Expenditures for new construction and improvements were \$300,861 less than the previous year. The company owns 177,510 shares of the common stock of the American Smelters' Securities Co., of the par value of \$17,751,000, carrying control.

At the time the Securities company was organized it was believed that the company would be obliged to advance, under its guarantee, some portions of the dividends accruing on the series B stock, until the Securities company was able fully to operate its projected smelting plants. No such advances, however, have been made. Under mortgage requirements the outstanding bonds of the Omaha & Grant Smelting Co., maturing in 1911, have been reduced by \$112,000, leaving but \$237,000 outstanding.

The report of the Securities company shows that the earnings for the first six months of the year amounted to but \$1,318,146, while for the last six months they reached \$2,308,280. The projected new construction has been nearly completed, and the mining properties are now being efficiently and economically operated. Expenditures for ordinary repairs, betterments, new construction, and improvements, charged to profit and loss, have amounted to \$1,276,726.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

POCKET-BOOK OF USEFUL FORMULAE AND MEMORANDA FOR CIVIL, MECHANICAL, AND ELECTRICAL ENGINEERS. By Sir Guilford L. Molesworth and Henry Bridges Molesworth. Small 12mo., pp. 899, Ill. E. & F. Spon, New York, 1908. Price \$2.

This is the 26th edition of a handy little volume which contains tables, formulae, and short-cut solutions of a large number of problems. It covers surveying, strength and weight of materials, earthwork, masonry, framed structures, hydraulics, mill-work, workshop methods and recipes, general machinery, steam engineering, power application, and quite extensively reviews the subjects of algebra, trigonometry, calculus, and conic sections, with special reference to their practical utilization.

TABLES OF THE PROPERTIES OF STEAM AND OTHER VAPORS, AND TEMPERATURE ENTROPY TABLE. By Cecil H. Peabody. 8vo., pp. 138. John Wiley & Sons, New York, 1908. Price \$1.

The tables in this work have been entirely re-computed, following the experimental investigations of Callendar, Barnes, Knoblauch, and Thomas. All the tables for saturated steam have columns of entropy due to vaporization, and the table in metric units has been made into a conversion table, by aid of which properties can be found in either metric or English units. The temperature-entropy table gives solutions of all adiabatic problems, both for saturated and for superheated steam. The tables are preceded by an elementary discussion of the properties of steam.

MINERAL RESOURCES OF THE KOTSINA-CHITINA REGION, ALASKA. By Fred H. Moffit and A. G. Maddren. U. S. Geol. Survey, Bull. 374, pp. 103, Ill., map. Washington, 1909.

This is a timely report containing much fresh data on the region from which mineral was first reported, 1741, in Alaska, and one which is now attracting considerable attention because of the development of deposits of the same mineral—copper.

Commercial Paragraphs.

H. R. WHITEHEAD, formerly with the United States Mint at Denver, is now associated with The Elspass Engineering & Mining Machinery Co., Denver, Colorado.

S. B. BELDEN has been promoted to the position of sales manager in the mining machinery department of The Jeffrey Mfg. Co., with headquarters at Columbus, Ohio.

The WESTINGHOUSE ELECTRIC & MFG. Co. has removed the sales office formerly situated at Tucson, Arizona, to 173 San Francisco street, El Paso, Texas, where it will be continued as a branch of the Los Angeles office.

The POWER & MINING MACHINERY Co., Cudahy, Wis., has lately secured an order for a converter plant from the International Smelting & Refining Co. The installation consists of 5 stands and 12 shells, 96 by 150 in., electrically operated.

Catalogues Received.

ATKINS, KROLL & Co., San Francisco, have issued a leaflet discussing the uses of ferro-alloys in foundries.

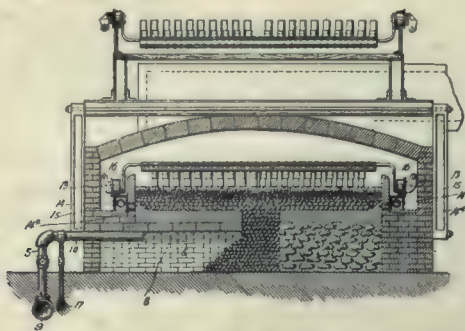
THE TRENTON IRON Co., Trenton, N. J., has just published a new catalogue giving complete description and many views and drawings of Bleichert aerial tramways.

THE DIAMOND FIRE BRICK Co., Canon City, Colorado, issues a neatly bound catalogue giving the shapes of silica and fire brick and fire-clay tile which it carries in stock.

THE JEANESVILLE IRON WORKS Co., Hazelton, Pa., is distributing its Bulletin No. 30, describing centrifugal pumps. The company reports that its business is greatly increasing, and that it has recently received orders for a number of large pumps.

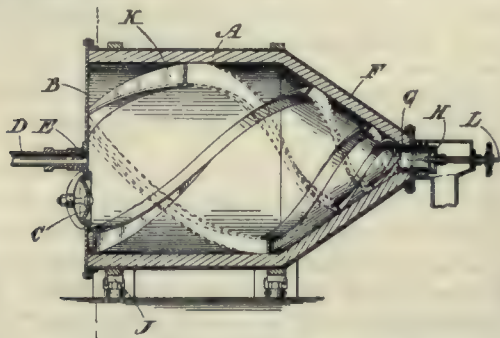
MINING AND METALLURGICAL PATENTS.

ROASTING-FURNACE.—No. 919,000. John E. Greenawalt, Denver, Colorado.



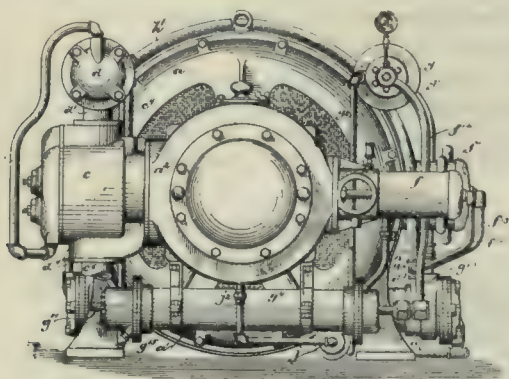
In a reverberatory roasting-furnace, the combination of a porous hearth supporting the ore in its passage through the furnace, a rabble for working the ore through the furnace and over the porous hearth, and means for delivering air or gases to the porous hearth whereby it is caused to pass through the pores or interstices of the hearth to the ore mass.

APPARATUS FOR USE IN SOLUTION AND PRECIPITATION PROCESSES.—No. 918,749. Woldemar Hommel, London, England.



In an apparatus for use in solution and precipitation processes the combination of a rotatable horizontal cylindrical barrel a door for the introduction of solids at one end of the barrel and a central inlet pipe for the introduction of fluids, a tapering outlet at the other end of the barrel, an outlet valve at the end of the tapering outlet, and spiral channels arranged in the drum and in the tapering outlet for the purpose of mixing the solids and fluids and conveying the flowing mixture through the apparatus.

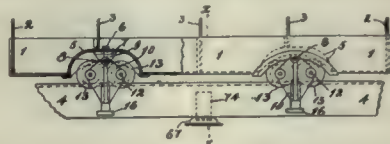
ELECTRIC AIR-COMPRESSOR.—No. 918,194. Augustine J. Pockock and Richard E. Allgire, Dayton, Ohio.



In an air-compressor, the arrangement of the circuits of air and cooling medium by arranging a plurality of cooling devices with a plurality of compression devices and a pump and conduits directing the cooling medium from the pump direct to each cooling device, means for discharging the cooling medium from each cooler to the compressor jacket, and means for directing the air from each compressor cylinder to a cooler in a direction opposite to that of the cooling medium circuit, substantially as specified.

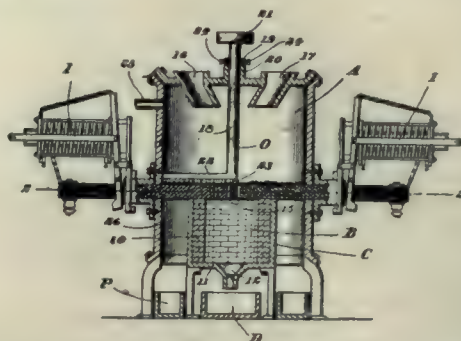
TRANSPORTING APPARATUS FOR MINES.—No. 918,661. Alfred E. Davis, Johannesburg, Transvaal.

In apparatus of the nature specified, in combination, a



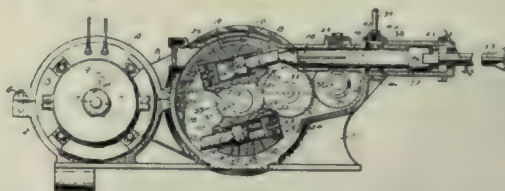
vehicle body, dish shaped bearing pieces secured to the bottom of the body and forming recesses on the underside, an eyebolt revolvably carried by each bearing piece, a pivot plate revolvably mounted on each eyebolt, a bogie carriage for each bearing piece constructed in its upper portion with holes and a pivot pin for each carriage engaging the holes in the upper portion thereof and engaging holes in the pivot plate and eyebolt.

ELECTRIC FURNACE.—No. 917,796. James H. Reid, Newark, New Jersey.



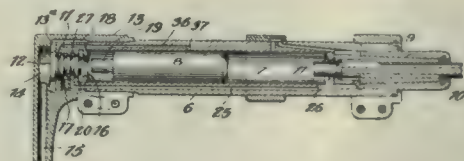
An electric furnace having a plurality of horizontally extending electrodes of different polarity adapted to constitute a table within the furnace and to produce arcs between, and a sweep adapted to spread the ore on the electrodes and clean it off the same.

ROCK-DRILL.—No. 917,074. Corwill Jackson, Madison, Wisconsin.



In combination, a rotating body having a chamber formed in it, a hammer member located in said chamber and free to move axially therein under the action of centrifugal force, the centre of gravity of said hammer member being at one side of a line radial to the axis of rotation and perpendicular to the line of movement of the hammer, a device in a position to be struck by said hammer, and means for cushioning the hammer when it rebounds after each blow.

HAMMER-DRILL.—No. 919,270. Daniel S. Waugh, Denver, Colorado.



In an instrument of the character set forth, the combination with a cylinder member, of a piston operating in the cylinder member, a valve casing having a valve chamber, an inlet and exhaust conduit for the cylinder member communicating with one end of the valve chamber, and a valve operating in the chamber and having an internal exhaust passage provided with an inlet that opens through the end of the valve and communicates with the end of the chamber with which the conduit communicates.

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TABLE OF CONTENTS.

| EDITORIAL: | Page. |
|---|--------------------------|
| Notes | 165 |
| The Selby Fume Case | 166 |
| Producing Cost of Copper..... | 167 |
| BY THE WAY | 167 |
| GENERAL MINING NEWS | 170 |
| SPECIAL CORRESPONDENCE | 175 |
| CONCENTRATES | 181 |
| DISCUSSION: | |
| Slime Concentration | C. 182 |
| Placer Mining Conditions in Colombia..... | L. J. Hohl 182 |
| Postal Rates on Specimens..... | D. W. Reckhart 184 |
| ARTICLES: | |
| Investigation of Ferro-Boron..... | |
|K. Iwai and J. C. Ballagh | 185 |
| Smelter Versus Oil Fume..... | Eugene B. Braden 192 |
| Conservation of Natural Resources..... | 194 |
| A Russian Money Trust..... | George E. Walsh 195 |
| Mineral Production in Virginia in 1908..... | |
|T. L. Watson | 196 |
| Brown Type of Laboratory Agitator..... | T. S. Lawlor 197 |
| Mineral Deposits of Trebizond..... | 198 |
| Haines District, Alaska..... | W. A. Scott 198 |
| The Tyuticha Zinc Mine..... | Chester W. Purington 200 |
| Nostrums..... | F. H. Mason 201 |
| Guatemalan Mining Code | 202 |
| Electrically Driven Power Shovels..... | 203 |
| Coal Output of Missouri..... | 203 |
| DEPARTMENTS: | |
| Personal | 169 |
| Obituary | 169 |
| Market Reports | 168 |
| Publications Received | 204 |

EDITORIAL.

NANKING is to have an exposition in "the fifth moon," otherwise May, next year. Thus civilization creeps up the Yangtze.

PASSENGER trains have begun to run north from Valdez. The journey as yet possible is only 43 miles, but at fifteen cents per mile that is perhaps enough.

ATLANTA is the last camp developed in Nevada. Discovered by a plucky woman prospector, all gallant miners will hope it may not disappear under closer investigation, as did the fabled Atlantis.

ZINC in ores containing over 20 per cent is hereafter to pay a tariff of one cent per pound, but in ores containing less, a lower rate. Considering the fact that zinc ores containing less than 40 per cent can not be economically imported, this saving clause is not likely to be of much comfort to the zinc smelters.

IRRIGATION will be discussed in all its phases at Spokane next week, and the following week the Trans-Mississippi Commercial Congress will assemble at Denver. The vexed question of railway rates and the relations of the Forest Service to the Department of the Interior are likely to provoke lively tilts at both meetings.

LAND which is unappropriated and unreserved is still more common in the United States than many realize. In 1908 there were 754,895,000 acres, of which, however, approximately half was in Alaska. The principal waste land in the East is that which is swampy and subject to overflow. Of this there are over eighteen million acres in Florida alone.

WAGON ROADS will no longer be admitted as available toward meeting the requirements for expenditures on mining claims prerequisite to patent. By a decision of the Secretary of the Interior on January 21 of this year, such work, whether performed on the claim itself or on adjoining claims, is rejected. The Regulations, however, make an exception where it can be clearly proved that the construction of the road is essential to the exploitation of the deposit.

KENTLAGE, on which the new tariff is to be \$2.50 in place of \$4 per ton, is not so mysterious as it sounds, being merely pig iron laid in the hold for ballast. The origin of the term is not altogether certain. Apparently 'kent' goes back to the Danish 'kant', an edge or border, hence a corner, an angle, a slope, or a sloping position, as when a boat is 'canted', which naturally results when it is propelled

or pushed along. 'Ledge', from having served for shelf, has come to mean to naval architects a piece of the deck frame lying between the deck beams, and in this way the combined words serve to indicate that which is laid down in a boat. By such curious paths do words come to serve us.

ENTRY of the railroad from Mexico into Guatemala is a notable event. It opens the country to American capital as never before. Central America is almost a virgin country in the development of its mineral resources, and Guatemala has remained in the rear of its neighbors in this respect. But the Republic is reputed to possess important deposits of lead and zinc, and in certain portions gold is found in the streams. Iron and manganese are also reported. We publish in this issue extracts from the Mining Law now in force, which is liberal both to native and alien. It would seem, however, that the law is lacking in coherency, and might easily lead to troublesome litigation. Under such circumstances, foreigners organizing mining companies in Guatemala would naturally seek special charters as a means of protection.

POLITICS in Costa Rica turn on the question of monopolistic control, so familiar at home, and also the material out of which party slogans are made in Mexico. The issue in Costa Rica, with Señores Jimenez and Iglesias as rivals, standing respectively for and against the dominance of the United Fruit Company, involves also the delivery of the minerals of the country into the hands of monopolies. The Abangarez Goldfields of Costa Rica, a child of the United Fruit Company, holds a princely concession in the northwestern corner of the Republic, where it is operating gold-mills. This concession is practically in perpetuity. Other concessions, tying up still larger areas, are contemplated. The system in principle is bad. The only mitigation would be to farm out the minerals on these territories to corporations, reserving certain public rights in their exploitation. But that is not the way of the Spanish Americans. Concessions as there extended give rise to the policy which we know as that of the dog in the manger.

The Selby Fume Case.

It has been our privilege on several occasions to call attention to the spirit of fairness shown by the Selby Smelting & Lead Company in its efforts to settle the questions arising from annoyance caused by smelter fume. This week we print an article by Mr. Eugene B. Braden, vice-president of the Selby company, which is an instructive exposition of the trials of a modern smelting company. The struggle is with a prejudice against which argument is unavailing. The case now before the court is all the more interesting because it is not confused with blackmailing motives. No damages in money are sought; a community considers itself injured; it seeks relief; and such relief, according to its view, would involve the closure of the smelter. It is not uncommon for a certain class of speculators to take up agricultural lands in the vicinity of new smelters

for the purpose of being 'damaged' by fume, thereby hoping to reap a double harvest. It used to be the custom to placate farmers in the vicinity of smelters by paying bounties; but the spirit of graft grew so insistent that the smelters have been forced to adopt sterner policies. The case of the Selby smelter, however, is today detached from considerations of monetary damages. The residents of Benicia are so sure that only a smelter can produce bad odors that they refuse to believe it when the smelter is shown to be closed and every furnace cold. The continuance of the suit for permanent injunction is surprising, after it was demonstrated to a committee of reputable citizens from the town of Benicia that the odors complained of were in evidence even when the fires were all drawn at the works. It shows how blinding a force is prejudice.

The Selby company has been making notable experiments to overcome the nuisance from smelter fume. Among these is the application of the principle of the electric discharge through the smoke, causing precipitation of all solid matter, including sulphuric anhydride. This device, elaborated by Mr. F. G. Cottrell, professor of physical chemistry in the University of California, has reached a state of perfection such that the fume passing through the chambers issues free from all substances except fixed gases. As a result of the bag-house and the Cottrell apparatus combined, no injurious or noxious gases are today issuing from the Selby smelter. This is to be proved in court, and the case appears to be so clear that a denial of the petition for injunction seems assured. A favorable verdict will have a wide-reaching influence, as did that of Judge Hunt at Anaconda, but in a different way. The Anaconda case involved construction of a point at law; that some damage had been done was not denied; it was a question whether injury to a few individuals might be made the cause for suspending a great industry and thus pecuniarily injuring a large number. The Selby case involves no balancing of conflicting interests; the ascertainment of the fact of injury, or not, from smelter fume is the concern of the Court. That the nuisance has been caused by fume from oil-refining seems practically certain. Tests of the air affected by the refinery fume show the presence of hydrogen sulphide and allyl sulphide, the latter possessing a pungent odor, resembling garlic, which is not esteemed in Benicia, since the population is not essentially Sicilian. Allyl sulphide is one of the higher organic compounds, in which sulphur replaces some of the oxygen atoms. Its odor is so penetrating that it may be detected even when the atmosphere contains only one part of the gas in sixty millions. It has also been shown that, of the gases issuing from certain oil-refineries on the Bay, about 20 per cent consists of allyl sulphide, and other ethylene hydrocarbons offensive to the smell. The vindication of the Selby plant will be a great victory for the smelting industry in general; it will demonstrate, not that such works must be tolerated for the greater benefit they confer, but that they are no longer a detriment to the health of the community in their neighborhood. How any other decision can issue, in the face of the facts known to us, is inconceivable.

Producing Cost of Copper.

A striking analysis of the copper production of America was made by our contemporary, the *Boston News Bureau*, that merits consideration by those contemplating the development of new properties. The argument is similar to that which we had already stated, which is based on more elaborate figures, namely, that low-grade ores are dominant. It is from the low-grade deposits that the cheapest copper is being produced. The world has learned that flashing superficial displays of high-grade copper ore are deceptive; that the great copper-mining industries of the world are not founded upon any such basis. The lowest-cost copper district in America today is Michigan, where the total expense falls below 8 cents per pound, and it is at the same time the district in which the average copper-tenor of all ores mined has been lowest, namely, $2\frac{1}{2}$ per cent. The Ely district, in Nevada, is approximately the same as to percentage of metal and cost of production. This parallelism is merely accidental, for the conditions of mining and treatment are utterly dissimilar in the two regions. The interesting thing is that, given a large mass of low-grade ore, whether it necessitate deep mining or may be scraped off from the surface with a steam-shovel, the mere largeness of volume admits of inexpensive operation, which yields better returns than can be won from the higher concentrations in veins of moderate size.

The total copper output of the United States now amounts to about 1,300,000,000 pounds per annum, of which 35 per cent is produced at less than 9 cents per pound, and 38 between 10 and 11 cents, while 13 per cent is marketed at a cost higher than $12\frac{1}{2}$ cents, which for the most part represents a loss to the producer. It is estimated that the average cost of the entire copper output of the United States is 10 cents per pound, which does not take account of all capital and construction expenses. When all items are included, the average cost will approximate $10\frac{1}{2}$ cents per pound. The method pursued by the Calumet & Hecla is worthy of emulation by other corporations; all outlay, whatever be its character or amount, is instantly charged in the department to which it pertains, and affects the final estimate of the cost of production. No effort is made to juggle with the item by spreading it over a period of years to which it might be assumed as applying. Then and there it goes against the cost of the metal. It may hurt immediate profits, but in the end the law of averages will adjust the accounts. An enterprise is successful only when its total income is exceeding total outgo.

On the showing made it is evident that the limit of cost for permanently prosperous copper mines is approximately 11 cents. The bulk of the output, or 525,000,000 pounds, is from mines where the costs approximate that figure. In this class are found the Anaconda, Osceola, Quincy, Mohawk, Boston Consolidated, Greene Cananea, Granby, Old Dominion, and Detroit. These are all great properties, but several of them experienced serious embarrassment during the recent financial crisis. Evidently safety requires that new promotions should be based on estimates not in excess of 10 cents per pound.

BY THE WAY.

Inks, Ancient and Modern.

Mr. George H. King, recently discussing the chemistry of ink before the Colorado Section of the American Chemical Society, said:

Ink in some form became a necessity with the step beyond inscription on clay or stone. Dye stuffs were commonly used by the ancients. The earliest inks were in the form of pigments held in suspension by some gummy substance, either vegetable or animal. They were used with a brush or a reed pen. Blue and black have been favorite colors from the beginning, while red was used in the early books and papers for illuminating capital letters and headings. Lampblack, very commonly used, was made by the burning of oil, tar, or rosin, and mixed with gum or honey and kept in cakes or wafers until wanted for use, when water was added. This, of course, made only a sticky, colored mixture, but with the use of reed pens the requirements were not so great as those demanded at the present day for use in our fountain pens. Indigo was used in India and Egypt long before the Christian era. The quill pen came into use about the sixth century. This allowed a greater degree of latitude in writing, and the inks were made thinner than those used with brush and reed pens, and were necessarily of a less durable character, departing oftentimes from the lampblack and indigo, which were always good. Two centuries later the black ink formulas showed a marked improvement. India or Chinese ink was really the first practical ink, so far as durability or lasting qualities are concerned. This, having a finely divided carbon as its base, was to be relied upon, but, being made into cakes and used with a brush, as used by the Chinese at the present day, it was not suitable for use with any kind of a pen. In the twelfth century nut-gall ink was first brought into use. The term 'gall-ink' refers to that made from nut-galls or tannin with iron sulphate and some gummy vehicle. For several centuries this was the standard used, and many are the documentary monuments standing to its credit. The writer has in his possession a number of fine specimens, some of which are several hundred years of age, written in the original Latin and Spanish, the characters of which still retain their pristine blackness.

The inks of today may be classified as black writing ink, chemical writing fluid, colored writing fluid, copying ink, safety ink, India or Chinese ink, and the secret or sympathetic inks. The latter, however, is little considered, as it has no standing or commercial value. Copying inks are usually made by the addition of sugar, glycerine, or glucose to the ordinary writing fluid. The requisites of a good black writing ink or black writing fluid are that it flow readily from the pen, indicate in a short time a black color, and penetrate the paper to an appreciable degree, and, more important than all the rest, be of great durability. When kept in a closed vessel no sediment of any account should be precipitated. Previous to the discovery of the soluble anilines, which became practical about 1874, logwood, madder, orchil, and other dye-stuffs were used.

PATENTS AND THE PATENT OFFICE.

At a recent meeting of the New York section of the American Chemical Society W. H. Swenarton contributed the following to the discussion:

The trade mark is a development of the ancient shop sign. Even the Egyptians are known to have displayed inscriptions denoting their trade in conjunction with an emblem to further indicate it. Also among the ancient Greeks signs were employed to proclaim their calling. In the ruins of Pompeii and Herculaneum discoveries are reported of representations of various kinds, let into the pilasters at the side of an open shop, as, for example, a goat by a dairy; a mule driving a mill at the baker's, and at the door of the school-master's, what has been termed, "the not over-tempting allurements to knowledge," comprising the representation of a boy receiving a good birching. These trade emblems were doubtless introduced into England at the time of the Roman invasion.

Originally, owing to the limited number of traders, the signs were indicative of the trade, and were employed in the same capacity as we now use street numbers. Gradually, as competition increased in these particular trades, and the shops became designated by street numbers, the sign-board fell into disuse. Then it was that the trade mark came into active use, being merely in the beginning a transfer, so to speak, from the door of the shop to the article of merchandise. A critical review of famous trade marks would form an interesting lesson in psychology, and would doubtless supply a fund of useful information to the memory-system doctrinaires.

No consideration of the influence of invention upon industry can be complete without a review of the functions of trade secrets. The influence of trade secrets upon industry has been marked, from the earliest times. The guilds of the Middle Ages are famed for theirs. It is often, however, feasible to take out patents, and there are those who still believe with the examiner who was appointed to the Patent Office in 1854, and who upon resigning shortly after declared: "I believe in a little while there will be nothing for the Patent Office to do, as everything is already patented, and I am going to get out of this and engage in some permanent business." It appears to be the same old story "that familiarity breeds contempt." On the other hand, the following from Karekiyo Takahashi, the special commissioner appointed by the Japanese Government to gather data regarding our Patent system, may be quoted:

"You will remember that it is only since Commodore Perry in 1854 opened the ports of Japan to foreign commerce that the Japanese have been trying to become a great nation like the other nations of the earth, and we have looked about us to see what nations are the greatest, so that we could be like them; and we said, 'There is the United States, not much more than one hundred years old, and America was not yet discovered 400 years ago'; and we said, 'What is it that makes the United States such a great nation?' And we investigated and found that it was patents, and we will have patents."

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, August 5.

| | | | |
|--------------------------|--|--------------------------|--|
| Antimony..... | 12-12 ³ / ₄ c | Quicksilver (flask)..... | 44-44.50 |
| Electrolytic Copper..... | 15 ¹ / ₂ -16 ¹ / ₂ c | Spelter..... | 6 ¹ / ₂ -7 ¹ / ₄ c |
| Pig Lead..... | 4.60-5.55c | Tin..... | 32-33 ¹ / ₂ c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|-------------------------|-------|----------|--------------------------------|
| July 30..... | 12.87 | 4.29 | 5.44 | 50 ⁷ / ₈ |
| " 31..... | 12.87 | 4.29 | 5.46 | 50 ⁷ / ₈ |
| Aug. 1..... | Sunday. No market. | | | |
| " 2..... | 12.87 | 4.29 | 5.46 | 50 ³ / ₄ |
| " 3..... | 12.87 | 4.29 | 5.49 | 51 |
| " 4..... | 12.93 | 4.29 | 5.63 | 50 ⁷ / ₈ |
| " 5..... | 12.93 | 4.29 | 5.56 | 50 ⁷ / ₈ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | July 29. £ s. d. | Aug. 5. £ s. d. |
|------------------------|---------------------|--------------------|
| Camp Bird..... | 1 7 6 | 1 7 3 |
| El Oro..... | 1 5 6 | 1 5 6 |
| Esperanza..... | 2 16 3 | 2 16 3 |
| Dolores..... | 1 10 0 | 1 10 0 |
| Oroville Dredging..... | 0 12 6 | 0 12 6 |
| Mexico Mines..... | 6 8 0 | 6 9 0 |
| Tomboy..... | 1 1 3 | 1 1 3 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

Closing Prices.

| | July 29. | Aug. 5. |
|--------------------------------------|--------------------------------|--------------------------------|
| Amalgamated Copper..... | 83 ¹ / ₂ | 81 |
| American Smelting & Refining Co..... | 95 ¹ / ₂ | 95 ¹ / ₂ |
| Boston Copper..... | 15 ¹ / ₂ | 15 ¹ / ₂ |
| Butte Coalition..... | 25 ¹ / ₂ | 25 ¹ / ₂ |
| Cumberland-Ely..... | 7 ¹ / ₂ | 7 ¹ / ₂ |
| Dolores..... | 6 | 6 |
| El Rayo..... | 2 | 2 ¹ / ₂ |
| Giroux..... | 9 ¹ / ₂ | 9 ¹ / ₂ |
| Greene-Cananea..... | 10 ¹ / ₂ | 10 ¹ / ₂ |
| Indiana Sonora..... | 3 | 3 |
| La Rose..... | 87 ¹ / ₂ | 8 |
| Miami Copper..... | 15 ¹ / ₂ | 16 ¹ / ₂ |
| Nevada Consolidated..... | 23 ¹ / ₂ | 24 |
| Newhouse..... | 2 | 2 ¹ / ₂ |
| Nipissing..... | 10 ¹ / ₂ | 10 ¹ / ₂ |
| Ohio Copper..... | 4 ¹ / ₂ | 4 ¹ / ₂ |
| Tennessee Copper..... | 38 ¹ / ₂ | 38 ¹ / ₂ |
| Utah Copper..... | 51 | 51 |
| Yukon..... | 5 ¹ / ₂ | 5 ¹ / ₂ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

August 5.

| | |
|--------------------------|--------------------------------|
| Adventure..... | 7 |
| Allouez..... | 46 |
| Arcadian..... | 4 |
| Calumet & Arizona..... | 105 |
| Calumet & Hecla..... | 680 |
| Centennial..... | 34 ¹ / ₂ |
| Copper Range..... | 82 ¹ / ₂ |
| Daly-West..... | 8 ¹ / ₂ |
| Franklin..... | 17 ¹ / ₂ |
| Granby..... | 103 |
| Greene-Cananea, ctf..... | 10 ¹ / ₂ |
| Isle Royale..... | 28 ¹ / ₂ |
| La Salle..... | 15 ¹ / ₂ |
| Mass..... | 8 ¹ / ₂ |

Closing Prices.

August 5.

| | |
|---------------------------|---------------------------------|
| Mohawk..... | 64 |
| North Butte..... | 56 ¹ / ₂ |
| Old Dominion..... | 56 ¹ / ₂ |
| Osceola..... | 140 ¹ / ₂ |
| Parrot..... | 83 |
| Santa Fe..... | 2 ¹ / ₂ |
| Shannon..... | 16 |
| Superior & Pittsburg..... | 17 |
| Tamarack..... | 70 |
| Trinity..... | 13 |
| Utah Con..... | 44 ¹ / ₂ |
| Victoria..... | 4 ¹ / ₂ |
| Winona..... | 6 ¹ / ₂ |
| Wolverine..... | 154 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, August 5.

| | | | |
|---------------------------|-------|----------------------------|------|
| Atlanta..... | \$ 15 | Mayflower..... | \$ 8 |
| Belmont..... | 55 | Midway..... | 20 |
| Booth..... | 10 | Montana Tonopah..... | 79 |
| Columbia Mtn..... | 10 | Nevada Hills..... | 80 |
| Combination Fraction..... | 61 | Ophir (Comstock)..... | 1.27 |
| Daisy..... | 23 | Pittsburg Silver Peak..... | 47 |
| Fairview Eagle..... | 18 | Rawhide Coalition..... | 30 |
| Florence..... | 2.92 | Rawhide Queen..... | 23 |
| Goldfield Con..... | 6.52 | Round Mountain..... | 69 |
| Gold Kewenas..... | 9 | Sandstorm..... | 8 |
| Great Bend..... | 7 | Silver Pick..... | 12 |
| Jim Butler..... | 8 | St. Ives..... | 6 |
| Jumbo Extension..... | 18 | Tonopah Extension..... | 49 |
| Llanos Con..... | 82 | Tonopah of Nevada..... | 7.05 |
| Mac Namara..... | 29 | West End..... | 58 |

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

BERTRAM HUNT is in London.

W. H. SHOCKLEY is in London.

ROBERT H. RICHARDS is at Salt Lake City.

W. F. FERRIER has been in San Francisco.

R. GILMAN BROWN was recently in Cornwall.

E. C. THURSTON is temporarily at Geneva, Ohio.

C. S. HERZIG has reached London, from Nicaragua.

H. R. NORSWORTHY was in San Francisco this week.

HENRY LOUIS is studying the ore deposits of Algiers.

HERBERT HAAS was in London, on his way to Magellan, Chile.

DONALD F. FOSTER is with the Bibiani company, in West Africa.

S. J. TRUSCOTT has an office at 43 Threadneedle St., London.

J. PARKE CHANNING and H. C. HOOVER are motoring in Cornwall.

J. HARLAN HARTLEY, of San José, Costa Rica, was in San Francisco.

R. A. F. PENROSE, Jr., was in San Francisco and Los Angeles this week.

LIONEL LINDSAY is with the Bunker Hill & Sullivan at Kellogg, Idaho.

ROBERT T. HILL has returned from London and is now in southern Nevada.

A. F. McEWEN is superintendent for the Nova Scotia Co., at Cobalt, Ontario.

R. C. ALABASTER is now manager of the Oonah mine, at Zeehan, Tasmania.

W. H. HOBBS has been in the Yakutat Bay region of Alaska this summer.

ROWLAND FEILDING has left London to examine mines on the Irtysh river, Siberia.

GEORGE N. ROBERTS, manager of the Associated mines, at Kalgoorlie, is in London.

ROSS B. HOFFMANN sailed from Liverpool on July 24, returning to San Francisco.

GEORGE J. BANCROFT was in San Francisco, on his way to Yuma, Arizona, this week.

A. E. DRUCKER has been visiting the Bendigo and Ballarat districts of Victoria, Australia.

HENRY C. JENKINS has been appointed principal of the Redruth School of Mines, Cornwall.

W. J. ADAMS is now consulting engineer of the Jumper mine, in Tuolumne county, California.

R. A. VARDEN, of the firm of Bainbridge, Seymour & Co., is on his way to Baranquilla, Colombia.

EDWIN J. COLLINS, of Duluth, Minn., is examining gold and copper properties in northern Sonora.

F. L. BOSQUI has accepted a position with Wernher, Belt & Co., and will leave for London August 20.

LYDD D. SKINNER, of the Four Metals Mining & Smelting Co., Keeler, Cal., has been in San Francisco.

W. A. CARLYLE, the new professor of metallurgy in the Royal School of Mines, London, is in Norway.

T. A. RICKARD has resigned as a member of the council of the Institution of Mining & Metallurgy, London.

C. G. PATTERSON, engineer for the Butters Filter Co., is at Johannesburg; he passed through London in July.

S. J. SPEAK, of the firm of Hooper & Speak, has returned to London from a professional visit to the West Coast of Africa.

CHAS. J. BANDMANN has returned from a trip to Sonora, Mexico, and will leave shortly for Quatrino Sound, Vancouver Island.

FREDERICK GRUNDY returned last week to Los Angeles from examining properties in the Calico district, but left at once for Needles, California.

THEODORE J. HOOVER is in Asia Minor, where he is installing a metallurgical plant for the Minerals Separation Co. at the mines of the Caucasus Copper Co., Ltd.

COREY C. BRAYTON, for the last five years manager of Guggenheim properties in Missouri, California, and Mexico, has resigned and opened an office in the Clunie building, San Francisco.

Obituary.

The world lost one of its foremost scientific men in the death of Prof. Simon Newcomb, at Washington, D. C., Sunday, July 11. He was buried with the honors due his rank as a retired rear-admiral of the navy, the services being attended by President Taft and many men notable in the scientific world. Professor Newcomb was appointed professor of mathematics in the United States Navy in 1861; assigned to duty a short time later at the United States Naval Observatory; negotiated contract for and supervised construction of the 26-in. equatorial telescope; secretary United States Transit of Venus Commission, 1871-74; observed transit of Venus at Cape of Good Hope, 1882; became senior professor of mathematics in United States Navy, with rank of captain, and Director Nautical Almanac office, 1877-97; retired at age of 62, in 1897. Few men in this country have had such a profusion of honors heaped upon them as Professor Newcomb. He was foreign associate of the Institute of France—one of eight, and the only American to hold that honor since Franklin—and was medalist of the Royal Astronomical Society, of the Royal Society, of the Dutch Society of Sciences, and the Astronomical Society of the Pacific; he was given the Sylvester prize of Johns Hopkins and the Schubert prize of Russia; France in 1893 made him an officer in the Legion of Honor, and in 1907 promoted him to the grade of commander; Prussia bestowed upon him the unusual honor of knighthood in the Order of Science and Art. The most important work which he accomplished is an almost complete reconstruction of the theories of the motions of the bodies of the solar system. This great work involved at its foundation the complete revision of the so-called constants of astronomy. The distance of the earth from the sun; the displacement of the earth in its orbit by the attraction of the moon; the displacement of the stars due to the motion of the earth, combined with the motion of light, which involves the velocity of light and space; the yearly precession of the equinoxes; the obliquity of the ecliptic; the dimensions and the masses of the planets—all had to be worked into a homogeneous system to be used as a basis for the tables of the sun and planets.

ROBERT E. C. STEARNS died in Los Angeles, July 28, at the advanced age of 82 years. Mr. Stearns was prominently identified with public and scientific life of the Pacific Coast and throughout the United States. He was paymaster of the Lake Superior copper mines in the early 50's; deputy clerk of the California Supreme Court '62-3; natural history collector in Florida; assistant curator, department of Mollusks, Smithsonian Institution; and paleontologist on the U. S. Geological Survey. He was an honorary life member of the California Academy of Science.

S. P. JELLUM, of Elk City, died at Newsome, Idaho, July 12. He was a graduate of the University of Minnesota, a keen observer, and an excellent writer. He did much to stimulate the development of his adopted State, publishing an excellent little handbook entitled 'Some Central Idaho Gold Districts'.

Dividends.

On Wednesday, August 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid Dividend No. 143, of \$45,000. This makes the amount of dividends paid since January 1, \$435,000, and the total to date, \$11,106,000.

General Mining News.

ARIZONA.

COCHISE COUNTY.

At the Inspiration mine in the Miami district the Joe Bush shaft is being sunk 20 ft. per week. This is down 350 ft. and has cut a body of concentrating ore in the gray schist that averages 3% copper.—Shipments from the Black Warrior averaged 80 tons per day for July, which is an increase of 40% over the previous month. The ore is being stoped at the 300-ft. level.—At the Miami the main work is on the smelter and sinking the main four-compartment shaft. This will be put down 600 ft., as the orebody has been proved to that depth. The ore is a secondary chalcocite in an altered gray schist averaging 2% copper that can be concentrated in the ratio of 16 to 1.—The adit of the Princeton Mining & Smelting Co., in the Huachua mountains, is in 1700 ft. and a new compressor installed at the mine. Henry Hamburg, the manager, has purchased the adjoining claims from Abe Campbell.—Operations are to be resumed on the Willie Rose copper mine at Portal. A shaft is down 60 ft. in a fair-grade copper ore.

GILA COUNTY.

The Gibson Copper Mining Co. is shipping 10 tons of high-grade copper ore per day. The shipping ore averages 18% copper and the low-grade which is stored on the dump runs 3%. Most of the development work is on the fifth and sixth levels.—The development at the Hamilton shaft of the Cactus Development Co. is confined to cross-cutting from the 600-ft. level. T. W. Hamilton is superintendent.

GRAHAM COUNTY.

The Stevens Copper Co. is doing a small amount of development on its property at Metcalf. Operations are to be resumed shortly at the Chase Creek Copper Co.'s property. I. N. Stevens will be in charge of the work.—The Standard Consolidated Copper Co. is shipping regularly to the Morenci and Douglas smelters.—The Coppermines Co. of Arizona has purchased two 8-in. churn-drills to prospect its property in the Clifton-Morenci district. J. O. Baylor is superintendent.—The Fumarole mine, 12 miles from Saford, has been closed down until a new power plant can be installed. F. A. Woodward is manager.

MARICOPA COUNTY.

E. C. Rogers & Son have sold their property in the Bill Williams district for \$32,000 to Lyman & Co., of Los Angeles, who are representing Eastern capitalists.

MOHAVE COUNTY.

The vein in the face of the drift on the 70-ft. level of the Ruth mine is in \$60 ore.—The shaft of the Carter Gold Mines Co. is down 100 ft. A machine-drill has been installed and better progress is expected.—Rich ore is being sacked at the Bonanza mine for shipment to the El Paso smelter. Ed. Patterson is the owner.

YAVAPAI COUNTY.

The Penn-Arizona Mining Co. has completed the unwatering of the Mudhole mine at Walker and is installing the new electric hoist. The new shaft is down 230 ft. and has opened a body of sulphide ore.—The first unit of the lead smelting plant to be erected at Mayer will have a capacity of 100 tons per day. The management will rely chiefly on the Bodie mine for its supply, but there are a number of mines in the district that could work their ores if it were not for excessive freight rates. In the Turkey Creek district the Silver Chord mine has a large tonnage of lead-silver ore blocked out. In the Tip Top district the Brooks mine is credited with a similar output. The Black Warrior, Silver Prince, Peck, Crown King, and a number of smaller properties in the Bradshaw mountains will be tributary to this plant.—The La Garcia Gold & Copper Mining Co. has taken over the Red Bluff group, six miles east of Dewey. All litigation in which the old company has been engaged for two years has been settled, and the new company will install a new surface plant and resume operations. A 4-ft. vein of copper-gold ore has been opened

on the property in the Yavapai schist belt.—At the New Cumberland mine at Pine Flat the development work is confined to driving and blocking out ore on the 300-ft. level. The mill will be started as soon as a supply of water is available.—The Blue Bell mine has been unwatered and cross-cutting started on the lower level.—At the Silver Mountain group, eight miles south of the Crown King mine, a series of veins have been opened by a 300-ft. shaft and an 800-ft. adit. F. X. O'Brien is manager.—The Eleanor Placer Mining Co. has purchased the machinery for a dredge and is hauling lumber for the boat to French gulch. The company owns 1440 acres one mile east of Walnut Grove. The dredge will be of the suction type and have a daily capacity of 1500 cu. yd.—The dredge of the Speck Mining Co. on Lynx creek has been started with satisfactory results. The company owns 160 acres on which the gravel is from 8 to 12 ft. deep.

CALIFORNIA.

ELDORADO COUNTY.

The McGeachin Mining Co. has purchased the Morning Star mine from Harold T. Power and D. W. Lubeck for \$20,000. The company owns the McGeachin, Jupiter, and Big Dipper properties.—The Mt. Pleasant Mining Co. is re-opening its mine near Grizzly Flats. The 10-stamp mill has been repaired and cross-cuts started from the 600-ft. level. F. C. Van Schaick is manager.

INYO COUNTY.

On the Golden Siren group, 17 miles from Bishop, a shaft has been sunk 50 ft. on a vein which assays from \$40 to \$100 and varies from 1 to 3 ft. in width.—Sim & Reeder have sunk a 26-ft. shaft on a 14-in. vein of good milling ore.—On the property of John Beauregard an inclined shaft is being sunk in a 3-ft. vein, 6 in. of which is of shipping grade.

MARIPOSA COUNTY.

A 2-stamp mill is being erected on the property of the Trujillo Mining Co. at Grizzly Flats. A 100-ft. shaft has been sunk on the vein that assays \$25 per ton. C. G. Lewis is superintendent.

NEVADA COUNTY.

(Special Correspondence).—By August 9 the Brunswick company expects to commence sinking a vertical three-compartment shaft to a depth of 1200 ft. C. A. Mallen is superintendent.—The old Cornish pump has been extracted from the Empire shaft and the two new electric centrifugal pumps are being installed.—The adit at the Fruitvale is in 400 ft.—The Greek vein at the Union Hill is showing up well. Clifford A. Graham is superintendent.—The 8-ft. vein on the 500-ft. level of the Idaho-Maryland continues to assay well. Twenty stamps are dropping in the mill.—A 20-in. streak of rich ore has been opened in the 4-ft. vein on the 400-ft. level of the Yuba mine. Samples run \$100 per ton. T. M. Chase is superintendent.—William Graham and associates are installing an elevator at the Brophy ranch to treat a large deposit of gravel.

Grass Valley, August 3.

Considerable high-grade ore is being opened on the 400-ft. level of the Yuba mine near Washington. T. M. Chase is superintendent.—A 200-ft. shaft is to be sunk at the Mountaineer mine near Nevada City. The Mountaineer property is nearly three miles long and is one of the most consistent producers of that district. The shaft will be inclined to cut the vein system of the country.—There are 14 men working at the A. J. Quigley gravel mine near Grass Valley.

PLACER COUNTY.

A raise is being driven from the 2400-ft. adit at the Golden West gravel mine to tap the channel. E. H. Armstrong, of Grass Valley, is the principal owner.—The shaft of the Lukens mine is down 80 ft. and has cut a good vein of milling ore.—Good ore is being taken out of the Alameda and Annie Laurie claims.

SAN BERNARDINO COUNTY.

The streak of high-grade ore recently cut by the raise in the Big Chief property has widened to 6 in. and the richer portions assay from \$8 to \$10 per pound. This is the richest ore found in the district and is being sacked for shipment.

—J. S. Reece and associates have opened a body of silver ore on their Pearl property in the Silver Lake district. The prospect was located for its copper content, but the ore has changed completely in character from the outcrop, and now assays 400 oz. silver per ton. Considerable nickel and cobalt is present.

SHASTA COUNTY.

The excavation for the new ore-bins at the Mammoth smelter has been completed and the foundations are being installed. The bins will be 160 ft. long by 30 wide and will be the terminal of the recently completed tramway.—The Balaklala Consolidated Copper Co. is experimenting with a bag-house to remove the harmful gases from the smelter smoke.—The Gold Leaf narrow-gauge will be in operation in a short time, and the properties in the Lower Springs district west of Redding will have an opportunity to ship their silicious ores to the Mammoth and Balaklala smelters for flux.—The Onn Copper Mining Co. has been organized to operate the Spread Eagle group northwest of Copley.—A 20-hp. gasoline engine has been installed at the South Fork mine near Igo to run the compressor. Harold Rogers is in charge of the work.—A 90-ft. winze has been sunk on the Franklin property from the face of a 270-ft. adit, and a drift driven 126 ft. on a 4-ft. vein that assays \$60 per ton. On a 7-ton shipment of concentrate to the Selby smelter the net return was \$350 per ton. H. F. Musser is superintendent of the property, which is situated at French Gulch and owned by the Western Exploitation Co.—Al. Prater has leased the Texas mine in the Old Diggings district and is shipping the ore to the Balaklala smelter for flux. The property has been idle for several years.—Lessees on the Mammoth quartz mine in the same district are shipping flux to the smelters.

SIERRA COUNTY.

A 25-ft. drift from the cross-cut adit opened an ore-shoot in the Twenty-One mine near Alleghany that contains considerable free gold.—Development work is to be started on C. C. Ward's Oriflamme mine.—The 10-stamp mill at the Rainbow has been started, the initial run being satisfactory.—The Four Hills mine above Downieville is being re-opened. The Four Hills has an excellent record for past production, and with modern methods should become an active producer.—The San Juan ditch is being repaired to carry water from the Middle Yuba river to the Delhi mine.—A car, rails, and blacksmith outfit has been packed to the Golden Scepter mine and an adit will be driven through the bedrock to tap the old channel.—The drift at the Rosasco mine is in a fair grade of milling ore and it is expected to open the rich shoot at any time.—The Claybank mine near La Porte is being re-opened. The adit has been cleaned out and drifts will be started in the gravel. Several attempts have been made to open the channel previously, but have proved unsuccessful, as the ground is very heavy.—C. W. Root is opening a drift-mine on the old channel near Gibsonville.

TRINITY COUNTY.

The Fairview mine at Papoose has shut down and is to be abandoned. All the improvements are being sold off. The company is reported to have lost \$350,000 in fruitless prospecting. The Fairview five years ago was the most important quartz mine in Trinity county, employing 150 men and supplying ore to keep a 40-stamp mill in operation.—Wilson & Ehrmann have leased the Knob mine in Eastman gulch from Joseph Gifford. The ore assays from \$350 to \$400 per ton.—Paulsen Bros. & Richards are shipping \$200 ore to the Selby smelter.—The mill of the Brown Bear at Deadwood is running continuously on high-grade ore.—The Lappin company is installing an electric-power plant. The current will be furnished by the Northern California Power Co.—The West Point Mining Co. has a lease on the Leas & Nichols mine and is building ore-bins and a tramway to convey the ore to the Black Bear mill.—A new car and a lot of rail has been shipped to the Oversight mine in the Yellow Jacket district.—On the Pioneer claim of the Blue Jacket group a 3-ft. vein has been cut that assays \$15 gold and 4 oz. silver per ton.—J. L. Kendrick & Co., of Boston, is to resume operations at the Detroit and

Brooklyn mines.—The Trinity River Mining Co. will complete its tunnel through the neck of the horseshoe bend on the Trinity river about the 15th of the month. A power-plant that will generate 1800 hp. has been installed at the mouth of the tunnel to furnish power to work the river bed.

TUOLUMNE COUNTY.

The Californian General Mining Co., a syndicate of London and Paris capitalists, has purchased the Jumper mine at Stent from the Jumper Gold Syndicate and has commenced re-opening the property. W. J. Adams is consulting engineer.—Some excellent ore is being mined by tributers at the Santa Isabel mine near Quartz. It is understood that the company may work the mine in the near future.—The Josephine mine near Algerine has been bonded by local men who will incorporate to work the property.

COLORADO.

BOULDER COUNTY.

The San Juan Exploration Co. is testing a tract of ground at Goldhill to ascertain its value as a dredging property. O. J. Potter is in charge of the work.

CLEAR CREEK COUNTY.

(Special Correspondence).—A company of Eastern men has secured the Eclipse adit holdings on Saxon mountain, and work was put under way the first of the week. The Eclipse adit, now in 1000 ft., will intersect the entire vein system of Saxon mountain, the portal being 800 ft. to the west of the Doric. S. D. Farout is in charge of the work.—G. J. Hite has started a new adit on the Sonora property on Griffith mountain, and by driving about 250 ft. the heading will cut under the point whence a production of \$40,000 was made a few years ago.—Surveyors have been at work for several days in going over the ground near the Doric adit where the new mill of the Griffith Mining Co. is to be erected. W. D. Hoover, of Denver, is manager.—A carload of concentrate was shipped last week from the Stevens mine. C. L. Tingle is in charge.—Heavy shipments are being sent out from the Wilcox adit. A force of from 30 to 40 men is being employed on company account. Stopping is under way and a body of ore is exposed on the Paymaster vein that is from 8 to 30 in. wide.—A rich find has been made in the King Bee mine that is being operated through the Newhouse tunnel. The discovery was made at a depth of 2200 ft. and at a distance of 12,000 ft. from the portal of the tunnel. The initial mill run was settled for on the basis of \$335 per ton.—Moonan & Oxley shipped a carload of smelting ore last week from the Lamartine mine that milled 2.18 oz. in gold and 18 oz. in silver, with 15% in lead. These lessees are stopping on a body of mineral that is from 10 to 18 in. wide.—The Josephine mine on Donaldson mountain has been secured under bond and lease by H. M. Corwin and associates, of Denver. The mine is equipped with a modern concentrating plant and was a heavy producer previous to four years ago.—O. W. Lowell, of Idaho Springs, has secured a lease upon the Sun and Moon mine and arrangements have been made to work it through the Newhouse tunnel.

Georgetown, August 1.

LAKE COUNTY.

The Carbutt, King Solomon, Niger Infant, Saint Crispen, and Maud Hicks claims on Breece hill have been consolidated and will be worked through the Carbutt shaft, which is now down 400 ft.—A new shaft has been started near the old Seneca incline to open the Seneca and Martha claims.—The drift on the Boulder property of the Little Evelyn Mining Co. on Little Ellen hill is being driven on a streak of high-grade ore. The shaft is to be sunk 460 ft. and lateral work started from that point. J. B. Stewart is manager.

OURAY COUNTY.

George Craft has leased the old Silver Bell mine east of Ironton.—A rich vein has been cut in the San Antonio mine in the Red Mountain district. A cross-cut from the main drift opened a 16-ft. blind lead that assayed 20% copper, 12 oz. silver, and \$1 gold per ton.—The Comotion Gold Mining Co. has opened a good body of ore and will commence shipping at an early date.—A gasoline engine and

compressor have been installed at the Amity Gold Mining Co.'s adit. Some excellent ore has been opened in the mine. F. J. Campbell is in charge of the work.—The old compressor has been taken from the Atlas mine to the San Pedro and a new 8-drill machine is to be installed at the Atlas.—John Donald has leased the Jonathan mine and has opened some rich ore.—The adit being driven to tap the shaft at the Calliope mine is now in 825 ft. A 24-in. vein of \$17 ore is being opened in the upper workings. Tim Manion is in charge of the work.

SAN JUAN COUNTY.

The new tramway at the Gold King mine has been completed. Victor E. Kerr is manager.—Kunz & Reed have completed their contract for 500 ft. of drifts in the Precious Metals mine near Silverton and the company has advertised for bids for 2000 ft. more work.—A new vein with considerable zinc has been cut on the Arpad property. Seven Waugh drills have been installed in the mine and the mill is being repaired. Should the zinc content continue to any extent an electric separator will be installed in the mill. W. B. Lowe is manager.

SUMMIT COUNTY.

The plans for a 100-ton concentrating plant have been drawn and the material for its construction ordered by the Colorado-Toledo Mining Co. for the Colorado-Toledo mine at Montezuma. The adit is now in 1100 ft. and heavier machinery will be installed at the mine. At the Pennsylvania mine near Argentine the mill is being re-built and the mine further developed. W. B. LeWald is manager of both properties.

TELLER COUNTY.

A 75-ft. cross-cut from the 960-ft. level of the Trilby mine cut a vein assaying as high as \$90 per ton. The company is shipping a car of ore per day.—The Requa-Savage Gold Mining Co. declared a dividend of $\frac{1}{2}$ c. per share on July 31.—The John Sharpe Machine Works of Cripple Creek is installing a spray washer for Milhoan & Mart at their lease on Raven hill.—The Modoc Mining Co. shipped two cars of ore to the Colorado City mills.

IDAHO.

BLAINE COUNTY.

The mill of the Idaho Mines Consolidated, Ltd., has been completed. Some \$500,000 has been expended on the plant, which is built in two units, one for wet, the other for dry concentration. Both halves are handling 150 tons of tailing per day, the wet portion concentrating 10 to 1 and the dry 8 to 1. The process is a new one and aims at the separation of the lead and zinc content of the ore. The Minnie Moore shaft has been unwatered to the 900-ft. level and will be drained to the 1100 within the next 60 days. The drifts at that level will be re-timbered and stopes started on the vein. The property is situated four miles south of Halley.—The 100-ton mill of the Independence Mining Co. has been completed and is now making its initial run. It is operated by electric power.—The machinery for the mill of the Boston-Idaho Mining & Milling Co. on Boyle mountain has been forwarded to the mine and the mill will be in the course of erection within a short time.

IDAHO COUNTY.

The Big Baldy Mining Co. is re-opening the Old Judge mine, now called the Washington, in the Buffalo Hump district. Joseph Pelikan, of Spokane, is manager.

LATAH COUNTY.

A 14-ft. vein of free-milling ore was cut by the adit of the Gold Mountain Mining Co., operating in the Hoodoo district. James Baumgartner is in charge of the work.—The Mountain Gulch Mining & Milling Co. has a lot of ore on the dump ready for shipment.—The adit of the Gold Nugget Mining Co. is in 400 ft. and is expected to tap the vein at any time. A depth of 300 ft. on the vein will be attained.—A new shaft on the property of the Inland Empire Copper Co., near Deary, is down 60 ft. and an adit started that will cross-cut the vein at a depth of 200 ft.—Considerable work is being done on the Gemmill property near Inland.

NEZ PERCE COUNTY.

The trail from Lookout to the Bullion mine is being

widened and re-graded to facilitate the packing in of a new sinking pump. A drift is being driven on a vein of copper ore.

OWYHEE COUNTY.

An electric blower has been installed at the Banner adit. This is now in 1380 ft. and has cut some stringers of good ore. The management expects to cut the main orebody within the next 100 ft.—Arrangements have been made with Eastern capitalists to finance the Wennersten Mining Co., near Silver City. A cross-cut has been driven several hundred feet toward the vein. J. M. Morgan, the manager, has been in Boise City purchasing machinery for the mine.

SHOSHONE COUNTY.

The drift on the property of the Samson Mining Co. in the Murray district has opened a shoot of ore that assays 60% lead and 74 oz. silver per ton. A. J. Brainard, the manager, has purchased cars, rails, and other equipment for the mine.—The adit of the Pandora Mining Co., adjoining the Snowstorm mine, is in 960 ft. John Weatherhead is in charge of the work.—The mill at the Bear Top mine is running steadily on good ore from that mine. A carload of concentrate was shipped to the smelter recently.—The Vienna Vein Mining Co. on Placer creek has resumed operations and let a contract to drive 50 ft. on the vein. W. B. Lively is secretary of the company.—A diamond-drill has been installed on the lower level of the Great Western mine east of Burke.—The Rockford Mining Co. is to resume work on its property on the west fork of Big creek. John Furst is manager.—An order has been placed for 1000 ft. of air-pipe and lumber for buildings at the Blue Bell mine on Big creek. A lower adit is in 700 ft. and some excellent galena ore has been opened in the upper workings. Gus Nelson is manager.—A carload of galena ore from the H. E. M. mine in Revenue gulch was settled for on the basis of \$28 per ton. This ore came from the upper level of the mine. A cross-cut is being driven lower down that is now in 550 ft. and should tap the ore-shoot within the next 70 ft.—On the Black Bear fraction near Gem a 1300-ft. drift has been run from the face of a 2000-ft. adit. This has opened an 8-ft. shoot of galena ore. Peter Bernier is manager.—The Imperial Mining Co. has installed an electric-power plant at the mine southwest of Burke, and wires are being stretched to carry the current. A 2700-ft. cross-cut is being driven to tap the orebody being mined in the upper levels. John H. Nordquist is manager.

KANSAS.

CHEROKEE COUNTY.

The new work north of Galena on the Ping and Robertson leases has opened an orebody between 200 and 300 ft. A new 400-ton concentrating plant is to be erected on each lease, to be supplied by the three-compartment shaft which is on the dividing line.—The New Jersey Zinc Co. has found a deep run on the Murphy land north of Galena, corresponding closely to the Ping and Robertson and also the Herald deposits.—A new deposit of unusual richness has been uncovered recently on the Middlesex ground at Badger, where the ore occurs from 90 to 100 ft. A 10-ft. face is said to run about 30% blende.—The more recent prospective work in the Galena camp is the plan of Waterhouse & Co. to build a 300-ton mill on the Maggie Taylor tract.—The Mission mine in the Baxter Springs camp has been purchased by Deane Bros. The ground is well opened and a small concentrating plant is on the property. The '3 F.' mill has also been sold.

MICHIGAN.

The Oneco Copper Mining Co. is preparing to diamond-drill its ground to prospect for the Baltic lode.—The Keweenaw Copper is drilling the fifth hole to cut what is believed to be the Kearsarge lode. Four holes drilled by the company on this lode have shown a good copper content. When this hole is completed the drill will be moved to the Osceola lode.—All work at the Cliff branch of the Tamarack has ceased and the property is now idle. Work there was entirely in the nature of exploration. Underground operations extended over a period of three years, in which time the Old Cliff workings were unwatered to a

depth of 250 ft. and a total of 3500 ft. of drifts run.—Operations at the Old Colony, which have been entirely in the nature of underground explorations, have ceased, and the property is again idle. The exploratory campaign just closed extended over a period of six years, in which time the property was extensively diamond-drilled and a thorough investigation of the half-dozen copper-bearing lodes disclosed was made. The very encouraging showings obtained in the drill-cores did not result in equal encouragement in the opening of the orebodies by drifts and cross-cuts, and though several bunches of good ground and one or two very large pieces of mass-copper were opened, the larger portion of the ground was barren.

MONTANA.

DEERLODGE COUNTY.

A large body of hubnerite, a tungstate of manganese ore, has been discovered by Benjamin Danials on the crest of Sugar Loaf mountain, at the head of Race Track creek, near Anaconda.

LEWIS AND CLARK COUNTY.

Thomas Cruse has purchased the Belmont mine in the Marysville district. The Belmont adjoins the Bald Mountain mine, which Mr. Cruse is now operating, and is one of the properties which served to make Marysville famous as a mining camp. A mill is being erected at the Bald Mountain mine, and will be ready for operation early this month.

MISSOULA COUNTY.

The shaft of the Josephine mine in the Nine Mile district is down 150 ft. and a contract is to be let for 100 ft. additional work. The shaft is sunk in a gold-silver-copper ore.—The drift at the Alameda mine is being driven on a 7-in. vein of high-grade ore. Edward J. Johnson is manager.—The Butte & Couer d'Alene Mining Co. is running a drift on a vein of oxidized copper ore on its property one mile from Saltese.

NEVADA.

CLARK COUNTY.

The main shaft of the Oxnard-Eldorado mine is down 200 ft. and a station is being cut at that point. The shaft is sunk in the vein, which is 20 ft. wide. A. J. Peak is manager.—At the New York-Searchlight the shaft cut the orebody at a depth of 300 ft. As a heavy flow of water was found, new pumping machinery has been ordered, and the company will continue sinking as soon as this is installed. W. W. Hunt is manager.

ESMERALDA COUNTY.

The long-threatened war of the Yerington-D. O. Mills interests, through their Southern Development Co., upon the property-owners of the Luckyboy district, has been started by the service upon Ivan J. Enderson, owner of the Hard-scrabble group of claims, of a subpoena to appear before the United States Circuit Court at Carson City on September 6, in a hearing in which he is made the defendant. The Southern Development Co. claims the surface and mineral rights of the land in question, and alleges that it obtained these rights by purchase from the State of Nevada after the passage of the Act of March 7, 1879, by which the State obtained a grant of 2,000,000 acres of land from the United States Government. The suit filed against Enderson is in the nature of a test case, as the decision involved will affect the titles of many operators. At the time of the filing of the test suit at Carson, notices of trespass were sent to R. V. LeGrand and J. H. Miller, ordering them to cease all operations upon the ground in dispute and alleging trespass.—The plant of the Goldfield Chlorination Works is being repaired and will resume operations in the early part of September. Benjamin Hall, manager for the Pioneer Reduction Co. of Nevada City, has purchased the controlling interest and is superintending the repair work.—The shaft of the Atlanta cut a body of copper-gold-silver ore at a depth of 540 ft.—The Morrison lease on the Daisy ground is shipping 5 tons of ore per day.

HUMBOLDT COUNTY.

At National development work on Charleston hill is opening a number of veins of high-grade ore. On the Stall lease

a 10-ft. vein has been opened that assays from \$15 to \$60 per ton, with streaks of high-grade.

NYE COUNTY.

(Special Correspondence).—At the West End considerable work is going on at the 275 and 400-ft. levels. Steady shipments of good-grade ore are being maintained.—The Fenestemaker-Hurley lease on the Joker has cut a 5-in. stringer of ore running \$300 per ton at a depth of 10 ft.—The Jolly Jane lease is installing a 20-hp. hoist.—The shaft at the Sunnyside mine of the Round Mountain Co. is down 700 ft. and ore is coming from every level to the mill.—The Millet Mining Co. is developing a promising vein in the Brooklyn group. Assays run from \$50 to \$400 per ton. A smaller silver-lead vein also has been traced for 225 ft. on the property.

Tonopah, August 2.

The Sunnyside mill of the Round Mountain Mining Co. at Round Mountain is nearly completed. A new 5-drill compressor has been installed at the mine, and both mine and mill machinery will be operated by electric power. L. M. Louis is superintendent.—The suction dredge installed on the claims of H. C. McCallum and E. D. Nurse at Manhattan handled over 300 cu. yd. of gravel per day successfully in its initial run. The estimated cost of operation is 25c. per cubic yard.—On the 1000-ft. level of the Tonopah-Belmont the stope on the South vein is over 100 ft. long on an orebody that averages 5 ft. in width.—At the MacNamara a new compressor has been installed and is now furnishing power for the hoist as well as the drills. Stopes have been started on an 8-ft. orebody at the bottom of the winze from the 200-ft. level. This ore is sent to the smelter without sorting. Work is to be resumed at the 765-ft. level and the vein prospected at that point.—The foundations for the new mill at the Tonopah Extension are completed and work will be started on the steel work next week.—The raise from the 635-ft. level of the Midway has reached the level above, and the winze is down 60 ft. on a stringer of fair ore.

WHITE PINE COUNTY.

G. L. Richard has announced that the Ely-Calumet Mining Co. will open its property to lessees. The claims are crossed by a dike containing stringers of high-grade ore and larger bodies of low-grade material.

NEW MEXICO.

GRANT COUNTY.

The Golden Giant mine at Pinos Altos has been purchased by D. J. Hayden, George M. Masterson, and Alvan N. White. There are six claims in the group, which has been prospected by a 750-ft. shaft with drifts driven in ore at each 100-ft. level. Some 8000 tons have been shipped to the smelter, which averaged \$30 per ton. There is a 10-stamp mill on the property, which will be repaired and put in operation.

OREGON.

JACKSON COUNTY.

Work is to be resumed shortly on the Opp mine, near Jacksonville. Some 2000 ft. of drifts and cross-cuts have been run, that opened five veins of low-grade ore. There is a 20-stamp mill on the property which is in excellent condition.

UTAH.

BEAVER COUNTY.

Recent assays from the Beaver Lake mine assayed 60% copper and \$3 gold. The company has several tons of ore of this grade on the dump preparatory to shipment.—A winze is being sunk from the fourth to the fifth level of the Cedar-Talisman. A good shoot of ore was cut by the drift on the fourth level, and it is this that the winze is following. There are two types of ore in the mine, one lead-silver and the other zinc. S. S. Pond is manager.

JUAB COUNTY.

The lower adit of the Uncle Sam mine cut a body of shipping ore at a point giving several hundred feet of backs. The company is shipping seven cars of ore per week.—The shaft of the Zuma mine, in East Tintic, is down 265.

ft. in a limestone formation.—At the Eagle & Blue Bell mine the winze from the 1000-ft. level is opening a body of ore assaying well in silver.—The Gemini shipped two carloads of ore to the smelter.—A contract has been let to sink the Grey Rock shaft 100 feet.

SALT LAKE COUNTY.

The Silver Shield Mining & Milling Co. is planning to issue five and seven-year bonds to raise capital to build a 60-ton mill and concentrating plant at its mine in Bingham Canyon. There are 9500 ft. of development work on the property, blocking out 14,000 tons of ore. Harry S. Joseph is manager.

SUMMIT COUNTY.

The cross-cut from the 1200-ft. level of the Daly-Judge mine cut a vein of good milling grade, with which was associated a small amount of zinc. At present the company is stoping ore on a 10-ft. vein.—The Little Bell Mining Co. is opening a stope at the bottom of a winze sunk 200 ft. from the 700-ft. level. A tramway has been completed to the Daly West mill, and the ore now coming from the mine, together with the low-grade material on the dump, will be sent there for treatment. E. L. Talbot is superintendent.—Work has been resumed at the South Dakota mine. Frank Walker is superintendent.—On the Andes claim of the Silver King Coalition Mines Co. the winze from the 1100-ft. level opened a body of lead-silver ore at a depth of 540 ft. The ore assays 48% lead, 400 oz. silver, and \$4 gold per ton and is found on a contact.

WASHINGTON.

CHELAN COUNTY.

The Chelan Butte Gold Mining Co. shipped a car of high-grade ore to the smelter. The ore comes from the surface



Map of Washington.

workings of the mine. The Chelan Consolidated Mining Co. is developing a vein of copper-gold ore that is 12 ft. wide and assays from \$35 to \$50. Several veins have been cut by the company's adit.

FERRY COUNTY.

The Lucile Dreyfus mine near Danville is shipping a car of first-class ore per week to the Granby smelter.—Work is to be resumed on the Pearl Consolidated mine in the Republic district. This mine was formerly known as the Lone Pine, and ore shipped from this property approximated \$100 per ton.—The Ben Hur mine, which has been idle for six years, has been re-opened and a 5-ft. orebody cut. The high-grade material will be shipped to the Granby smelter.

KITTITAS COUNTY.

Samples from the outcrop on the property of A. F. York, in the Swank district, assay \$300 per ton.

OKANOGAN COUNTY.

The Duluth-Toroda Mining Co. purchased the Bodie mine, 12 miles southeast of Chesaw, for \$22,500. There is a 10-stamp mill and cyanide plant on the property. These will be put in good condition and a new road completed to Chesaw. The mine has been opened to the 400-ft. level and 60,000 tons of ore blocked out. Henry Thompson is in charge of the operations.—A contract for extensive de-

velopment work has been let by the management of the Methow Belle Mining Co., operating on Lookout mountain, south of the Alder mine.—The Alaska Riverbed Mining & Development Co., started operations with its machine August 1 on the Similkameen river. The management claims this machine will clean up from \$45,000 to \$50,000 per month at that position.—A crew of surveyors is working on the proposed line of the Okanogan Electric railway. As there are over 40 prospects along the route considerable activity is manifested in the mining district that will be directly benefited by reduced freight rates.

STEVENS COUNTY.

The Alladin Mining Co., operating near Northport, has completed a 4000-ft. flume and 50-ton concentrator. The company is developing a body of silver-lead ore that assays 30% lead, 20 oz. silver per ton, and a considerable amount of zinc.—A full equipment of machinery, consisting of pump, hoist, and boiler, has been purchased by the Imperial Copper Mining Co., operating in the copper belt near Chewelah. P. J. Bonner is superintendent.—The vein in the shaft of the Oriole Mining Co., operating in the Metaline district, has widened to 5 ft. at a depth of 60 ft. and assays \$40 per ton.

CANADA.

BRITISH COLUMBIA.

The British Columbia Copper Co. is to enlarge one of its furnaces at the Greenwood plant. They are now 56 in. wide by 20 ft. long. The company will add 10 ft. to the length, making it the largest furnace in the Dominion. The company will also resume work at its Mother Lode mine.—The properties of the Sullivan Mining Co. were sold by the sheriff at Cranbrook to satisfy a judgment of \$12,000. A mortgage of \$400,000 against the property has been settled, and it is reported that the properties will be worked by the Federal Mining & Smelting Co., with James Finlay as manager.—The mill and cyanide plant at the Jewell mine, near Greenwood, will be completed the early part of September. It is to be operated by electric power from the Bonnington Falls power line.—Considerable activity is manifest in the Sheep Creek district, 25 miles north of Nelson. At the Queen mine the 20-stamp mill is producing between \$15,000 and \$20,000 worth of bullion per month. The Kootenay Belle is opening a 2-ft. vein that averages \$90 per ton, and the Nugget is working in high-grade ore.

ONTARIO.

A 3-in. vein of calcite, with some cobalt and native silver, has been cut by the drift on the 125-ft. level of the Empire mine near Cobalt.—Another drill has been added to the equipment of the Beaver, and a winze started from the 200-ft. level.—An 8-in. vein of cobalt and silver has been opened by surface-cuts on the J. H. Waldman property. A company will be incorporated to develop the find.—Ore valued at \$3750 per ton has been found on the prospect of Robert Steen at Sturgeon lake.—The 3-in. vein on the Slaght claim in South Lorraine has widened to 12 in., all of which is rich enough to ship.—At the 125-ft. level of the Keeley mine a 6-in. vein of calcite, with cobalt and silver, has been opened.

MEXICO.

CHIHUAHUA.

The Compania Minera de Naica is to build a smelter at Conchos for the treatment of its lead-silver ores. The company owns the San Pedro and adjoining properties in the Naica mining district. The plant will handle custom ores to obtain flux for its own output.

JALISCO.

The main vein on the El Favor property in the Hostotipaquillo district has been cut by the company's transportation tunnel when in 750 ft. The vein at this point was 55 ft. wide.—A. H. Harrison has bonded the old Refugio mine for \$85,000.—An 18-in. vein assaying 1000 oz. silver and 13 oz. gold has been cut in the San Pablo mine, in the Etzatlan district.

SONORA.

Iowa capitalists have bonded the Veta Grande mine from N. S. Finch of Bisbee for \$50,000.

Special Correspondence.

LONDON.

East Pool Difficulties.—Cornish Versus Electric Pumps.—Damages.

The East Pool mine at Camborne, Cornwall, has for some time been in an unfortunate position, owing to the continual decrease in the tin content of the ore mined. Recently mining circles have been startled by a revelation relating to the mining methods pursued by those in authority, and the result is that many have to admit the shattering of an idol. It was commonly supposed that East Pool was well managed, and in spite of what is known now of underground methods it can still be stated that the re-modeling of the dressing plant and the provision of the necessary capital therefor out of revenue during the time that high prices ruled for tin showed an enlightened policy on the part of

have been allowed to drift. The pumping engine does not do its duty properly, and the coal bill is therefore too high. Also the pit-work connected with the pumping plant has been allowed to get into a very indifferent condition. But the chief point in connection with Mr. Thomas's criticism relates to the utter absence of exploration and development during the last few years. He states that the whole of the ore mined has come from old stopes that were left in previous years as unprofitable, and that no new ground has been opened. This lack of exploration in depth he attributes to the fact that the pumps were unable to reduce the water-level sufficiently. I should add as my own opinion that the provision of an ore-dressing plant capable of treating complex ores was one reason why the old stopes were re-opened. However, Mr. Thomas gives detailed advice as to the more efficient arrangement of the existing pumping plant, and makes several recommendations relating to exploration work. The mine is not at greater depth yet than 1500 ft., as compared with Dolcoath's 3000 ft., where some of the best



A Group of Cornish Tin Mines.

the directors. East Pool is a cost-book company, and it gained the distinction of not dividing its profits up to the hilt. The company has done good work in ore-dressing, and successfully tackled the problem of separating magnetically the wolfram from the tin, arsenic, and copper. In addition, the experiment with the high-speed air-cushion stamps has been worthy of notice. For some months it has been evident that the content of the ore mined has been decreasing, and the financial results for the last three quarters have been disastrous. In January and April deficits had to be met, and now a further loss of £3479 has been incurred during the quarter ended June 30. The amount of ore treated was 15,834 tons, and the average produce was 19.2 lb. of tin concentrate, together with some wolfram and arsenic. The revenue from the tin content was £11,388, from arsenic £843, and from wolfram £1240. The tin recovery during the three months previous was 20.8 lb. of concentrate per ton. This continued drop could not be allowed to go on forever, and the directors determined to seek outside advice. Accordingly, R. Arthur Thomas, of Dolcoath, was asked to examine the mine. His report has just been issued, and it is far from complimentary to the late management. His opinion is that things underground

ore in recent years has been found. As mentioned a few months ago in connection with the adjoining mine, South Crofty, the success in depth at Dolcoath should encourage the other Camborne mines to spend money in sinking deeper.

From time to time reference has been made in this column to the difficulties experienced by Cornish mines in connection with electric pumping. The old Cornish pump has the advantage of running automatically with little attendance. It is not subject to breakdowns, nor is it expensive in power and repairs. But it has its limits of usefulness, and when unwatering operations, or sinking to great depths, are contemplated, it has become necessary for Cornish managers to investigate the claims of modern electric pumps. Unfortunately, owing to mining men not understanding the intricacies of electric machinery, and the electrical engineers not being in touch with the requirements of a mine, many of the plants so far erected in Cornwall have been failures, and mutual recriminations have been plentiful. One of the most recent cases is that of Great Wheal Busy at Chacewater. This mine was acquired a couple of years ago by a French syndicate of chemical manufacturers who were desirous of obtaining an independent supply of arsenic. The

syndicate arranged with a prominent firm of manufacturers of electrical machinery in London for the supply of a pump. As is usual in contracts of this sort there was a penalty-clause providing for damages in case the pump was not delivered in working order by a certain date. The case was complicated by the contracting firm not supplying the pump itself, but sub-contracting to other firms. It is not surprising, therefore, that with all the ins and outs of contracts and sub-contracts the efficiency of the pump and its applicability to the work in hand was obscured. In the end, there was great delay in the delivery of the pump, and when it was erected it could not be made to do its work. Consequently the mine-owners discarded it and are now putting a Cornish pump in its place. They also brought an action for damages against the firm that supplied the pump, and judgment has been given in their favor. A sum of no less than £2700 has been awarded to the mine-owners for the delay and the failure to work. The moral to be drawn from this story is two-fold. To begin with, in new ventures of this sort the presence of intermediaries involved in contracts and sub-contracts is highly disadvantageous to the actual contracting parties. It is a pity that the people who want a pump, and the people who design and make it, cannot get together and discuss requirements and capacities. The second consideration is that the mining engineers and the electricians ought to meet and learn each other's experience. A mining engineer accustomed to a Cornish pump imagines that all pumps, even electric pumps, should work efficiently with just as little attention and study. On the other hand, the electrician designs a pump with little or no knowledge of the rough conditions existing in a mine, and expecting the mining engineers and miners to be qualified to take care of the delicate anatomy of an electrical machine. One might as well expect a mule driver to train a race horse.

BRITISH COLUMBIA.

Consolidation of Copper Companies.—Shipments and Developments.

It is now officially announced that the British Columbia Copper and New Dominion Copper companies will consolidate. This has been largely brought about by the Lewisohn interests, which own stock in both. The mines of the British Columbia Copper Co. are to be opened next week. The trouble with the miners has been adjusted, and coke is coming in rapidly. That the British Columbia Copper Co. expects to treat a greater tonnage from now on than it has in the past is evinced by the fact that they have begun to enlarge their copper furnaces, lengthening by 10 ft. the now 20 ft. by 56 in. furnace. It is likely that the other two furnaces, 20 ft. by 46 in., will be enlarged in turn.

The Little Bertha mine, on the North Fork, shipped a 30-ton car of select ore during the past week, this being the first lot of ore sent out from the Little Bertha so far this year. The Granby Consolidated M., S. & P. Co. is making preparation for the shipment of a heavy tonnage from the Monarch section of its property. Development has disclosed an immense body of good ore in Monarch ground. In the new workings full advantage will be taken of gravity, the ore being sent through the Gold Drop to the big crusher at the tracks, a distance of about 3000 ft. The Granby shipments for the week ending July 25 show an increase of nearly 2000 tons over the previous week, and it is expected the figures will gradually climb until the high record of 25,569 tons for the week ending February 13 will be exceeded. The Snowshoe shipments are also increasing.

It is expected that a mere matter of days will see work resumed at the Le Roi mine near Rossland, now that the managing director, Mr. McMillan, is here, having returned from a successful business trip to London. Those who know the mining conditions in this district feel sanguine that the plan of development proposed will develop extensive deposits of the rich ore that has already been found on the 1650-ft. level of the mine. Twenty tons of rich gold ore was shipped from the I. X. L. mine during the past week. The property is being worked on a small scale, but the history of the West Belt is that rich ground may be broken into any day, when things will pick up. The June

smelter receipts of the Le Roi No. 2, Ltd., were \$34,282. This property is shipping a monthly tonnage of 2400 tons of \$22 average ore and is paying dividends.

During the fiscal year ending June 30 the smelter and refinery of the Consolidated M. & S. Co. of Canada, at Trail, produced gold, silver, and copper, also lead, to the value of \$5,500,000. Over 42,000 tons more of ore were treated than during the previous year. The portion of the output credited to the electrolytic refinery is \$2,700,000. It is fully expected that the figures for the coming fiscal year will far exceed those of the past, as the mining situation in British Columbia, and particularly in southeastern British Columbia, never looked more favorable than at the present time.

NEW YORK.

Dredging for Diamonds.—Metal Exchange Rules.—Trading in Copper-Warrants.—International Smelting.—Steel Shares.

Capital is being sought in New York for new plants to dredge for diamonds on the Jequitinhonha river in Brazil. Diamond-mining leases have been secured by Brazilian corporations promoted by American citizens for washing diamonds over several hundred miles of the river and its tributaries. The corporations propose to sub-lease their rights for one-third of the value of the products won by the dredges, provided a dredge is operated on every mile of river that is sub-leased. This method of sub-leasing has been developed lately in the vicinity of the city of Diamantina. About half a dozen small dredges are now operating on the Jequitinhonha. Most of them are of the bucket type, but as the river-bed, in places, is rough and stony, pump dredges have been installed. In addition to diamonds, gold, platinum and the platinum-metals, and numerous other gem-stones occur in the wash. It has been demonstrated that the dredging method of recovering the gems is in advance of the old Portuguese practice of washing and sluicing by hand. There is a good fall in the river above the city of Diamantina, where the chief dredging-claims are situated, and advantage is taken of the current to generate electric power. Most of the dredges are operated by electricity. No dredge has been able to much more than pay expenses. Some of the promoters of new dredging schemes, however, are circulating reports of great profits to the dredge-owners. These are likely to mislead investors, and it should be said that American investors should be careful to thoroughly investigate Brazilian diamond-mining propositions brought to their attention before acquiring interest in them. The United States Consulate at Rio de Janeiro is well informed upon the diamond-mining industries and will furnish particulars to investors.

The new rules of the New York Metal Exchange, which took effect on August 2, brought the business practice of the Exchange into conformity with that of the London Metal Exchange. A large amount of the business on the London Exchange is of a purely speculative character. Copper-warrants, for example, are traded in daily in a similar way to the wheat-trading in the Chicago wheat-pit. This kind of trading was not popular under the old rules of the New York Metal Exchange. Whatever trading in copper-warrants and 'futures' was done in this City was done through London brokerage houses. It is probable that the leaders of copper production will endeavor to make trading in copper popular in New York, in order to enable them to more easily manipulate the price of the metal. Steps are now being taken to start the business in a small way on the New York Metal Exchange. Copper ranks sixth in the list of speculative commodities, in respect to value—corn ranking first, with a value about 12 times that of the copper yield, cotton second, hay third, wheat, with a value of about 6 times that of copper, fourth, oats, valued at 3 times as much as copper, fifth, and copper sixth. The trading in futures in other commodities is world-wide, and some of the New York brokerage houses are asking why not trade in copper too. At present trading in copper-warrants is almost confined to London.

The meeting of the directors of the International Smelting Co., which was scheduled for July, and at which a divi-

dend was expected to be declared, was not held on account of a quorum being unobtainable. This has been widely commented on, and it is reported that the cause of the failure of the directors to meet was the condition of the stock market. The market being dull it was thought inopportune to have the stock listed on the Exchange in July. The company's earnings available for dividends are at present running at the rate of 12%. The directors will meet within a couple of weeks. It is probable that a 5% dividend will be declared, and steps taken to have the company's stock listed on the New York Stock Exchange.

The directors of the United States Steel Corporation at their last meeting reported that the steel business is gradually improving, and that the company's prospects are good. Tariff manipulation has enabled the company to advance the prices of steel products, and the prospects of increased returns have enabled the directors to increase the dividend from 2 to 3% per annum. Before declaring the increased dividend the price of the company's common stock was advanced from 42 to 72 $\frac{1}{4}$ %. The Exchange manipulation of the stock was carried out by an important New York bank working in co-operation with a powerful financial pool which operates extensively on the New York Stock Exchange in the stocks of many of the large copper mining and smelting companies, as well as in those of the United States Steel Corporation. Owing to the reputation of steel common stock the pool found it an expensive matter to advance the price of the stock. They succeeded, however, in distributing a large amount of it acquired around 30 and 40 at from 60 to 72. As soon as the whole of their holdings are distributed attention will be given to the distribution of the pool's holdings in copper and smelting companies. Copper stocks generally will, doubtless, advance in sympathy with the pool's operations in the stocks of companies it controls.

MEXICO.

La Blanca Purchase. — Santa Gertrudis Bonded. — Coneto District, Durango. — Balsas River Copper. — Oaxaca. — Hidalgo. — Hostotipaquillo.

The examination of La Blanca mine at Pachuca, Hidalgo, by John Hays Hammond and his engineers has been completed, and there is little doubt that the deal will be carried through. José V. de Landeros y Cos, president of the Santa Gertrudis y Anexas, which adjoins La Blanca, is quoted as stating that an option has been given Mr. Hammond on that property, and the figures are placed at \$9,000,000, or \$150 per share for the 60,000 shares. The Santa Gertrudis is one of the largest and richest of the Pachuca properties, and would be most desirable in connection with La Blanca for the organization of a large company and the economical working of both properties combined. There is no reason to doubt, therefore, that negotiations may be on for the purchase of the Santa Gertrudis, but there is certainly some mistake made in the price named, for the stock is selling on the market in Mexico City at \$116 to \$120, and there has been no rise in the price since it was reported that a sale was being negotiated; hence the figure of \$150 per share may be looked upon as high.

From the State of Durango come reports of rich discoveries in the old Strauss mine, in the Coneto district, now being operated by the Eva Mining Co.; the strikes were made in what are supposed to be old Spanish workings, and a number of rich veins are being uncovered. The Coahuila Mining & Smelting Co. is said to have found high-grade silver ore in the Alberto mine in the Mapimí district. The San Juan Mining Co., also of the Mapimí district, is shipping at the rate of 100 tons of ore per day, and at the same time is putting in new machinery to enlarge the output. This company is also planning to run its own railroad to Bermejillo, to connect with the Mexican Central, as the narrow-gauge now operating between Bermejillo and Mapimí is a private road of the Penoles Mining Co. It is not probable that very favorable terms, if any at all, could be obtained by an outside company that did not wish to ship to the Penoles smelter at Mapimí.

In Guerrero the Maine & Nebraska Mining & Smelting

Co. is planning to build a railroad to its mines on the Balsas river, and also to erect a 100-ton smelter. The Marian and Helen Reese, continuations of the Maine & Nebraska holdings, have been taken up by R. R. Robertson of San Francisco, and he will soon begin operation on these properties. Those familiar with this part of Mexico, on both sides of the river Balsas, in the States of Guerrero and Michoacan, unite in stating that some of the most wonderful deposits of copper in the world are situated there, and that it but awaits the facilitation of the railroad to surpass anything now known in Mexico in the production of that metal.

In Oaxaca the Indiana-Oaxaca Mining Co. has completed its tests and will proceed with the erection of a mill, and at the junction of the Parada and San Pablo rivers a 250-hp. hydro-electric plant will be placed for the generation of power for the mine and mill. At the Victoria-Tapada a tunnel has been started to cut the Victoria shaft at the 320-ft. level. Prospecting continues, and the mill is in



On the Trail.

course of construction. The concentration and amalgamation mill of the San José de Gracia, in the Sierra Juarez district, has not proved satisfactory. Changes will be made, a cyanide plant added, and probably the whole thing enlarged. In the San Juan, of Taviche, the bonanza ore that was found some weeks ago in the second level has been opened on the third level, and has added greatly to the expectations from the property. Need of a railroad from Mexico City to the Pacific is being agitated, and it is stated that the Mexican-American Holding Co., with \$40,000,000 capital, has been organized for its construction.

The work of the Seguranza Mining Co. in Zacualpán, Hidalgo, has awakened J. C. Mordough and associates of Mexico City to the possibilities of their old Socavón, and they have refused \$100,000 offered for it by the Seguranza company, and will start operations upon it themselves. At Zimapán, about 75 miles west of Zacualpán, but also in the State of Hidalgo, the Zimapán Mining & Smelting Co., in the last ten months has opened large bodies of ore in the San Francisco and Los Balcones; and extensive development is being carried on in the Flojonales by the R. S. Towne interests, and on the properties of the Hidalgo Consolidated Copper Co. by the Ludlow brothers.

The Mina Grande and Quebradillas, old Spanish properties in Hostotipaquillo, Jalisco, have been taken over by Luis Cherrillan and French associates, and extensive operations will at once be started. The new tunnel of El Favor has cut the vein at a depth of 750 ft., where it is said the

vein shows a width of 58 ft.; and in the San Pablo, at Etzatlán, operated by the El Favor people, an 18-in. vein, assaying several hundred ounces in silver and 5 oz. in gold, has been found. The Zapote, in the Magistral district, near Ameca, is temporarily shut down, while a new hoisting and pumping plant is being installed. The Buena Fé Mining Co., at Ojuelos, Jalisco, is putting in a gas-producer, and gas-engine for electric pumps, air-compressor, and a gas-engine hoist, and a stamp-mill is being planned as a year's supply of ore is blocked out.

BUTTE, MONTANA.

Heavy Litigation Brewing.—Johannesburg Gold Mining Company.—San Felipe Mine.—Bamar Company.

The copper production of the Butte mining companies for July aggregated 26,580,820 lb., an increase over June of a little more than 1,000,000 lb. The totals, figured on the basis of 29 working days for July, are as follows:

| Companies. | Tons daily. | Copper, lb. | Tons monthly. | Output, lb. |
|-----------------------|----------------|----------------|------------------|----------------|
| Boston & Montana.... | 3,520 | 264,000 | 102,080 | 7,656,000 |
| Anaconda | 3,610 | 227,430 | 104,690 | 6,595,470 |
| Butte & Boston | 650 | 40,950 | 18,950 | 1,187,550 |
| Washoe | 550 | 33,550 | 15,950 | 972,950 |
| Parrot | 400 | 23,200 | 11,600 | 672,800 |
| Trenton | 410 | 24,600 | 11,890 | 713,400 |
| North Butte | 1,400 | 119,000 | 40,600 | 3,451,000 |
| Butte Coalition | 1,350 | 102,600 | 39,150 | 2,975,400 |
| Original | 610 | 45,750 | 17,690 | 1,326,750 |
| East Butte | 400 | 28,000 | 11,600 | 812,000 |
| Miscellaneous | 100 | 7,500 | 2,900 | 217,500 |
| Totals | 13,000 | 916,580 | 377,000 | 26,580,820 |

Strife is said to have been brewing for over a year between the Amalgamated Copper Co. and W. A. Clark. The trouble arises from a dispute over the metes and bounds of veins. The big company, it is understood, claims the veins within prescribed bounds, and so does Clark. The mines of the claims adjoin, and the issue, according to rumors is whether or not Clark shall follow the orebodies outside the lines of his claim. This is an old difficulty at Butte, and Clark and the Amalgamated companies have clashed before over the same thing. It has produced litigation, in which Heinze and others have figured. This new wrangle recalls that the Amalgamated several years ago opened negotiations with Clark for the purchase of his properties at Butte, but the deal was never consummated. It is said on good authority that Clark once was asked to name his price, and complied. He was invited to come to New York and close the deal, and he started for the metropolis for that purpose, but on the way he raised his price ten millions, and the Amalgamated backed out.

When Clark was proprietor of the Colusa-Parrot mine, one of the Anaconda hill properties, he was accused of mining his ores from Anaconda territory. An injunction and damage suit resulted, and it was decided against him. The Anaconda company recovered heavy damages, and in the settlement of the case the Colusa-Parrot mine was turned over to the company. It is understood that Clark's right to mine below the 1200-ft. level is questioned, yet he is mining at a depth of 2000 ft. or more. The public is unacquainted with the details of the dispute, and is in ignorance of just what veins are involved, but it is stated that Clark has been served with legal notice to stop mining beyond specified boundaries. He has disregarded the notice, which makes it probable that he will give the Amalgamated company a fight.

Andrew Nelson, general manager of the big gold mine of the Johannesburg Gold Mining Co. at Neihart, Montana, who was here recently buying pumping machinery, declares that the company has the biggest gold mine in the country. He was the discoverer, and has been working for five years, the past two years being manager of the company. The mine has a vein 40 ft. wide on the surface, which has been developed continuously for more than a mile.

The new machinery, including an Ottumwa engine and a 100-hp. boiler, bought by Mr. Nelson, will be installed at

once. The 200-ft. level cross-cut has a fine showing. The company is capitalized for 300,000 shares at \$3 per share, and \$120,000 was put in the treasury during the hard times recently by the sale of 120,000 shares of the stock at \$1 per share.

The Cole-Ryan people are said to have purchased the San Felipe copper mines, in the Arizpe district, Sonora, Mexico. They belonged to P. Sandoval, of Nogales, Arizona, and John Henderson, of Pasadena, California. It is reported that they paid \$400,000 for them. The group contains seven mines. It is said that active development will follow the purchase. The Cole-Ryan people are having trouble with a mining investment in Mexico, near San Antonio de la Huerta. They have spent large sums of money developing the San Antonio copper mines there. Recently an Arizona engineer named R. L. Hogue took up a portion of the ground, declaring it had been left open by a defective survey, and it is understood that the copper people will fight for the title.

Increased activity in the development of an old copper property within 10 miles of Butte is a recent event. Omaha and Butte capitalists and mining men have organized the Bamar Copper Co., capitalized for \$1,500,000, and it has taken hold of the Erick Rehn mine on the Oregon Short Line road. The Bamar company has contracted for the construction of a shaft on the Rehn mine to the 500-ft. level. There is a good copper vein in the Linda claim of the mine developed by tunnel, and the company is making a raise to the surface from the main tunnel, a distance of 116 ft. When this is finished sinking below the tunnel will follow.

JOHANNESBURG, TRANSVAAL.

State Mining Scheme.—Stope-Drill Competition.—A 'Black Reef' Fiasco.—Rand Profits.—Half Yearly Dividends.—Cloverfield Shaft Assays.

The Transvaal Government has taken a most daring and original step into a new field of political economy. Since the war it has received in direct taxation about 8½% (10% with certain allowances deducted) of the profits of gold mining. More recently it has been negotiating with the mines to increase its interest by the sale of the mining rights below water-rights, dumping sites, stands, etc., reserved to the Crown. Now it has gone a stage farther and called for tenders for the establishment of State mines. Two large Government areas in the East Rand—deep-level ground near the Modderfontein Deep Levels Co.—are offered for leasing. The lessee of each area will have to put up in cash £350,000, estimated to be required for shaft-sinking and preliminary development, and to guarantee a further £350,000 to bring the property to a producing stage. Clearly then, the proposition is not one for 'small fry' to consider. It is stipulated that 25% of the preliminary capital required must be offered for subscription to persons resident in the Transvaal. The Government provides no capital, and consequently takes no risk in the undertaking. It is further stipulated that no vendors', promoters', or founders' shares shall be created, and that no commission or underwriting will be allowed. The profits accruing to the State will be determined on a sliding scale, ranging from the present minimum of 10% (as affecting all other mines) up to 50%. Within these limits, the State is to receive the same percentage of the profits as the profits are of the total yield. For example, if the yield is \$8 per ton and the profit is \$4, the Government would receive \$2 on its maximum of 50%. Upon exhaustion of the mine, the Government is to receive 10% of the proceeds from the disposal of plant, etc., but this consideration is of small moment, considering the probably long life of the areas under notice. One of these includes 1275 claims and the other 1358 (one claim being 64,025 sq. ft.) Assuming there are 15,000 payable milling tons per claim, the contents of the areas will each be about 20,000,000 tons, giving a probable life of 30 to 40 years.

Some figures made public by the management of the Stope-Drill Competition show that there has been a marked falling off in the efficiency of the machines as the effects of wear and tear have become more conspicuous, and also

an increase in the air-consumption. Tabulated comparisons of drilling speed and air-consumption stand as follows:

| Machine. | In. per Min. | | Cu. Ft. per Min. | |
|---------------------|-------------------|----------------|-------------------|----------------|
| | Elimi- nation. | June 17-22. | Elimi- nation. | June 17-22. |
| Chersen | 4.11 | 3.27 | 81.8 | 84.5 |
| Siskol | 4.46 | 2.59 | 74.2 | 78.2 |
| Climax Imperial .. | 3.52 | 3.03 | 68.5 | 85.2 |
| Konomax | 2.48 | 1.73 | 29.6 | 33.15 |
| New Century 00 .. | 2.33 | 2.19 | 53.4 | 65.6 |
| Holman 2 3/4 in.... | 3.12 | 2.47 | 99.9 | 33.5 |
| Holman 2 1/4 in.... | 2.40 | 1.85 | 75.1 | 69.8 |

Broadly speaking, the drilling speed underground now appears about 25% less than that recorded in the first elimination trials.

For a long time past, the history of Rand mining and finance has been happily free from 'ugly incidents'. It seems to be in the distant past that we experienced the disgrace which fell upon the credit of lesser mining houses through the deception of the public by the 'riches' of the Vlaklaagte tin farm, the booming of the Vaal river diamond diggings, the salting of Madagascar gold alluvial, and the announcement of false assay results from the Geduld shaft. Lately, however, another unpleasant affair has occurred, by which the public has lost much cash and a directorate all credit. Out in the far West Rand there are several farms which,

negligible. Its rise into greater favor might have resulted in a far more serious fiasco than the bursting of the Midas Deep bubble.

Some interesting and valuable experiments are now being conducted upon the Langlaagte Estate, Robinson, and other mines, with a view to still further increasing the crushing capacities of existing batteries. At a later date, I hope to be able to go into further detail, but at the moment it may be said that the ideas being developed are (1) the practicability of washing out, through screens, the sand and slime from the crushed ore before it is fed into the mortar box, and (2) the diversion of the pulp from the boxes to the other tables when the plates are being scraped and dressed. In the removal of the sand, a screen is used of similar mesh to that in the boxes, so that there is no wasteful charging of the boxes with a product already sufficiently finely pulverized for treatment. It is estimated that the undersize will be equivalent to 7 or 8% of the mill tonnage, and this elimination of this amount will certainly enable the stamp-duty to be raised substantially. The saving effected by the diversion of the pulp from the plates while dressing is in progress, instead of stopping the stamps, would probably mean an increase of about 2% in crushing capacity. During recent months of ample labor supply, the commonest cause for complaint upon the mines has been insufficiency of crushing plant rather than any difficulty in keeping the bins supplied with ore. But in the winter months the periodical shortage of labor may reduce the benefits of such schemes for the increase of stamp duties.

The rate of profit-realization has not been increasing rapidly upon the Rand during the past few months, though, if labor is forthcoming, it will show a big rise toward the close of the year. During the first five months of 1909, the returns have been for the whole Transvaal as given below: (Rand profits equal 98% of the total.)

| | Tons milled. | Yield. | Profit. |
|----------------|--------------|-------------|------------|
| January | 1,647,895 | £2,612,836 | £1,047,395 |
| February | 1,539,270 | 2,400,892 | 944,262 |
| March | 1,719,758 | 2,580,498 | 994,038 |
| April | 1,693,234 | 2,578,804 | 1,019,288 |
| May | 1,765,048 | 2,652,699 | 1,038,292 |
| Total | 8,365,205 | £12,825,729 | £5,043,275 |

From these figures it appears that 40% of the gold output is profit or that it is costing about 12s. to produce a sovereign's worth of gold. The dividend-payers are now making their yearly distributions and forty companies have so far announced an aggregate of £4,528,895, which compares favorably with the total for the corresponding period of last year.

The Main Reef in the East Rand basin has been cut by another shaft. The vertical shaft of the Cloverfield Mines intersected the Reef at about 2000 ft., and samples round the perimeter averaged 22.3 dwt. over 10 in. or 6.5 dwt. over an assumed stoping width of 36 in. The sections sampled show the variations characteristic of this region.

TORONTO, CANADA.

Cobalt Stocks and Developments. — Nova Scotia Mill. — Provincial Mine.—Gillies Limit.—Montreal River.—Elk Lake.

Interest in the Cobalt stock-market, which usually subsides on the approach of the dog-days, has been kept alive this season by a succession of discoveries affecting a number of the lower-priced issues. While there has been no sensational rise in values, there has been much activity in trading with a general upward tendency. A new find on the Beaver was made last week consisting of a smaltite and calcite vein struck at the 200-ft. level. It is from 14 to 18 in. wide and is stated to assay 9178 oz. silver per ton. The shares rose from 28 to over 40 on the announcement of this discovery, but have since dropped a few points. Nova Scotia is another of the non-dividend payers which has experienced a boost owing to a succession of finds, the first and most important of which, known as the 'Bilsky' vein, was struck on July 2 on the surface, and showed 4 to 6 in. of rich ore. It has since been uncovered for 225 ft. and



Street Scene in Johannesburg.

admittedly, are 'possible' Main Reef propositions. Their possibilities, however, are hidden by the overlying younger formations—the dolomite and Black Reef. The latter is a pyritic conglomerate closely resembling the Main Reef series, but the gold content is notoriously patchy—large stretches being barren and pockets running up to 100 oz. or more of fine-gold per ton. One of these Black Reef (cum-possible Main Reef) properties is held by the Midas Deep company, which recently re-started work upon the Black Reef. Shares were put up to \$8.25 on the strength of semi-official reports of a 10-dwt. grade being maintained. Two months' milling, however, gave an actual extraction of about 5 dwt. An investigation made by A. Heymann disclosed the rankest mismanagement at the mine, and an erroneous estimate of grade and extraction to have been made. The assaying at the mine was being done, in a place adjoining the extractor-house, by the cyanide manager while working a 12-hour shift. Results were quite misleading, and instead of a rich mine of high average grade, the Midas Deep is shown to be a characteristically poor mine which has contained some remarkably rich pockets. Of course, the shares collapsed (to \$2) and there have been angry demands for Government enquiries and other drastic proceedings. Those of the public who have been spectators have good reason to rejoice at the occurrence. If the Midas Deep, by means of its rich pocket, had been able to maintain an average grade of 10 dwt. for a few months, there was danger of a Black Reef 'boom'. This conglomerate covers vast areas of the Transvaal, is easily explored, and is able to yield those occasional abnormally high assays so dear to the heart of the unscrupulous manipulator. Generally speaking, its possibilities for company working are

found to maintain its quality. Excavations are being made on this property for the installation of a 100-ton compressor and a mill for treatment by cyanidation and amalgamation. It is expected that 92% of the silver will be saved. The plant will cost \$100,000. A shaft is going down on the new Blisky vein at a point where it intersects other veins, and an adit will be run to tap the vein at 110 ft. from No. 1 shaft. At the Hargrave a calcite vein varying from 3 to 7 in. wide has been struck in trenching near the Kerr Lake line and has been uncovered for 150 ft. Native silver is exposed for 30 ft. of the distance. This vein runs into the Kerr Lake property. The Cobalt Lake recently struck a 2½-in. vein at 195 ft., which was found in a cross-cut from the winze at the 110-ft. level at the southern end of the lake. The silver content is stated at 5000 oz. per ton. The City of Cobalt recently opened a new vein in a cross-cut at the 140-ft. level which, though quite narrow at first, widened to about 5 in., the ore running about 4000 oz. silver per ton. At the Kerr Lake, No. 7 vein on being cut at the 210-ft. level was found to maintain its value. Seven veins, on all of which large quantities of high-grade ore are blocked out, have been opened. The Coniagas has passed the dividend of 3% expected on August 1, the directors assigning as a reason the need of accumulating funds for doubling the capacity of the concentrating mill and equipping the mill with electric power. The announcement was followed by a slump in the stock, which dropped to \$5.25, nearly a dollar less than the price of the previous day, but afterward rallied slightly. Vein No. 64 of the Nipissing, which has proved a rich producer on the upper levels, has been struck at a depth of 250 ft., where it shows niccolite and argentite. Shipments of ore have been fairly well kept up lately, though the consignments of the last two weeks, totaling 917 tons, look comparatively small beside the record-breaking output of the preceding few weeks. Nipissing was well to the front with a total of 228 tons, Crown Reserve coming next with 153 tons. The Provincial mine, no news of which has been forthcoming for months, has at last been heard of again. It is announced that a new vein has been struck by diamond-drilling at a depth of 265 ft., close to the old workings. Another sale by tender has been made by the Ontario Government of lots in the Gillies Limit, concerning the value of which everybody, apparently, including the Government officials, is entirely in the dark. A number of the lots offered before which were left unsold because the tenders were too low were again submitted to competition, and 201 acres disposed of for an aggregate amount of \$47,204, or an average of \$225 per acre. As the sale is subject to working conditions and payment of a royalty, the vexed question as to whether there really is any valuable mineral in the locality is likely to be settled before long. The Ontario Bureau of Mines has issued a statement showing the metallic output of the Provincial mines and works for the first three months of the year. There is a decided gain all round, especially in silver, the output of which was 5,628,860 oz., valued at \$2,648,852, as against 3,673,047 oz., of the value of \$1,938,840 for the corresponding period of 1908.

The White Reserve mine, in the Montreal River district, appears to be making good. Development has been going on since April of last year, and 240 bags of ore stated to average 5000 oz. silver per ton has been mined. Thirty veins have been uncovered, nine of them showing native silver. The main shaft is down 150 ft. On the Gavin Hamilton, in the Elk Lake district, vein No. 5 at a depth of 110 ft. includes 3 in. of ore running 6000 oz. per ton. On No. 4 vein native silver is exposed at the surface. The Cleaves claim, another well known Elk Lake prospect, which contains about 50 calcite veins, several of which contain silver, has been bought for the Beacon Consolidated Mines of Boston. Active development work is being begun at the Welsh claims, Gowganda, which adjoin the much-advertised Bartlett mine, under C. H. Rogers, an English mining engineer who has had South African experience. The Nancy Helen, which has been in hard luck lately, has leased half of its northern 40 acres to S. D. Madden, under conditions which call for immediate development work and active prospecting.

DENVER, COLORADO.

Coal Trade.—Clear Creek News.—Boulder Oil and Tungsten Producers.—Cripple Creek.—Coal and Asphaltum in Wyoming.

Unusual activity along all lines of industry causes the coal trade to be very good for this season of the year. The Suffield mine of the Green Canyon Coal Co., near Trinidad, has been re-opened to supply the local market. The Colorado Fuel & Iron Co. is unable to get enough miners and coke pullers, and has had to bring in outside labor.

There has been a steady increase in production from the Clear Creek district during the last six months. The record of the Chamberlain-Dillingham Ore Buying Co. shows that 40% more ore has been marketed than in the similar period in 1908. The mines and mills of the district are working steadily, and there is a feeling of assurance regarding the success of the new smelter at Utah Junction. Ore is now being piled at this plant preparatory to starting up about August 1. The North American Smelter & Mines Co. is also in the market for ores from this district. It has the old Golden smelter almost ready to start, and has signed ore contracts with several of the mines. The company has just made a bond issue of \$500,000, which is backed by a mortgage on the Donaldson and Centurian group of mines near Idaho Springs. The Newhouse tunnel is in 20,000 ft. and steadily advancing into Quartz hill. A new vein was cut during the past week. It is believed to be the Burroughs vein. A peculiar feature in this tunnel-development project is that no water-courses of note have been found, and now it will be necessary to do considerable driving, and either raising or boring, to tap the water in the mines to be drained. The Federal Trust Co. of Massachusetts has begun foreclosure proceedings against the Gunnell Mines & Milling Co. for \$566,000 on first-mortgage bonds. The property involved includes that of the Gunnell, Grand Army, Fagan, Star of Hope, and Slaughter House Lode Mining companies, together with ground in Central City, Eureka, and Black Hawk.

The Boulder-Greely Oil Co., drilling in the Boulder oil-field, has brought in another oil-well. Oil was found at 1800 ft. and rose 500 ft. at once. A pump is being installed. The tungsten industry in Boulder county is not as active as usual. The operators are waiting to be sure what protective duty will be put on the ore in the new tariff schedule. Should the 15% duty proposed in the Senate by S. Gugenheim be adopted, the Primose company will erect a new mill on the Boulder county ranch, and the Wolf Tongue Mining Co., at Nederland will re-model and enlarge its mill.

The recent strike in Dead Ox gulch, about three miles west of Cripple Creek, has caused a great deal of prospecting to be done on the ranches in that part of the district. The Red Cloud Mining & Prospecting Co. has been encouraged by the find, and has advertised for bids for driving an adit 400 ft. and sinking a shaft 100 ft. on its property on Mount Ervey, three miles southwest of Cripple Creek. The bids are to be opened August 5. The Eclipse claim belonging to the New Haven Gold Mining Co. has been sold to the Joe Dandy Mining Co. for a stock consideration. This action settles the dispute over the apex rights of this claim. The five patented claims on Ironclad hill belonging to the Lincoln Mining & Milling Co. have been thrown open to lessees. Another aerial tram is about to be put in operation in the district. It will carry the ore from the Midget mine on Gold hill to the Gold Issue mill on Carbonate hill, two miles distant. A small labor war was precipitated recently by the contractors on the grading for the new Portland mill importing Italian laborers for the work. The Italians were run out of camp and one shot in the ensuing fracas.

The Interior Department has just finished classifying and returned to the public domain a large tract of land in the Evanston district, Wyoming. This tract is valuable coal land and had been secured from the Government by fraud. As the outcome of the Horse Thief Canyon cases, the offending coal company was forced to re-convey the land to the Government and pay \$40,000 for the coal extracted. A large bed of asphaltum is reported to have been found on the Shoshone Indian Reservation near Landers, Wyoming.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Felsitic or aphanitic forms of grano-diorite and monzonite have been called pantellerite and vulsinite. The former has been applied chiefly to such rocks on the more acidic extreme, that is, to the felsitic variety of grano-diorite.

Hydraulic pressed brick stands fire well. In tests made at the underwriters laboratory in Chicago, no damage was apparent after firing and before water was applied. Although a number of bricks cracked, 70% was found sound after quenching with water.

Lithium is widely distributed among igneous rocks, but in small amounts. It may be detected spectroscopically in samples from almost any volcanic rock, but its more common association is with granites and pegmatites, occurring in spodumene, lepidolite, amblygonite, and in some tourmalines. It is generally associated with soda rather than with potash.

Gypsum is not in large demand for any purpose in a crude state. It is converted into land-plaster, plaster of paris, and into hard finishing plasters, in which form it has a steady market. The deposits are sufficiently abundant so as to necessitate, first, that they be found in large bodies, convenient for economical mining, and second that they be situated favorably for access to market, else they would possess little commercial importance.

'**Lime spar**', as calcite is sometimes called, occurs frequently in veins, and often constitutes the entire gangue of an ore. It has no significance as an indicator of metals. It is not uncommon as an accompaniment of gold veins in the desert region of the Southwest, and gives evidence that the portion of the vein where it occurs was not deposited at a great depth below the surface, as calcite will not form except at moderate temperatures and pressures.

Talc is a hydrous silicate of magnesia. It is generally foliated, but may be fibrous. The laminae are flexible but not elastic. Its most distinctive physical features are its softness, it being easily impressed by the finger-nail, and its greasy, soapy feel. It is practically infusible, is not decomposed by ordinary acids, and is a good non-conductor of heat and electricity. When highly heated it loses a small amount of water, hardens, and is susceptible to polish. It varies in color from apple green to white.

Radium rays manifest their energy by their capacity for exciting the luminosity of various phosphorescent substances. Radium salts are themselves luminous. Radium disengages continuously a substance which behaves like a gaseous radio-active material, called the 'emanation'. Air which has been in contact with a solution of radium salts is charged with the emanation, and it becomes a strong conductor of electricity. The emanation is an unstable gas, and spontaneously disappears, even from a sealed glass tube. It possesses the property of imparting radio-

activity to all bodies in contact with it, such bodies being then said to possess induced radio-activity.

Asbestos is used for a constantly increasing variety of purposes in fireproofing and insulating. One of the notable applications in recent years is as a pigment under the name 'asbestine', which on account of its fibrous structure has the property of holding up other heavier pigments in the paint. Mixtures of asbestos with various compounds play an important part in fireproof construction. Such materials are asbestos building lumber, century shingles, asbestos slate, asbestic for stucco and plaster, and asbestolith.

Peat cannot be dried economically by artificial heat alone. Assuming that a drained bog contains 12½% dry peat substance, the wet peat contains 87½ lb. water. If 80% of the fuel value be utilized, 1100 B. T. U. are required to evaporate 1 lb. of water, and dry peat has a calorific value of 9000 B. T. U. In order to evaporate the water, therefore, there is required 87.5 times 1100 divided by 80% of 9000, or 13.3 lb., of dry peat substance, which is more than is contained in the peat.

Chromite is of value as a source of chromium, being the only mineral of commercial importance in which that element is found. The uses of chromium are metallurgical, in the manufacture of alloys and furnace linings, and chemical, as a constituent in coloring materials, mordants, oxidizing agents, and tannages. Chromium gives to steel a marked degree of hardness, and, if added in the proper proportion, does not produce brittleness. Chromium steel alone or alloyed with tungsten or molybdenum is used in the manufacture of high-speed tools, and alloyed with nickel or manganese is used in files, ball-bearings, armor-plates, and armor-piercing projectiles.

Vesuvius emits a lava containing about 48% silica, 18 alumina, 7.6 iron oxide (FeO), 9 calcium oxide, and 7 potash, being thus remarkable for its high potassic content. The amount of potash has increased over that contained in older eruptions from the same vent. The lava ejected consolidates as an almost holocrystalline rock, resulting from devitrification and larger development of the microlites. The glass inclusions of the leucite are often transformed into augite and titanomagnetite. The phenocrysts of leucite developed before the lava issued from the crater, but the microlites formed during the period of superficial flow.

Nova Scotia contains many deposits of iron ore. Magnetite is present, but not in promising amounts, except as a metamorphic product from hematite. Specular hematite of high purity has been found in small discontinuous bodies. Clinton ore is present at Torbrook and elsewhere in its usual character. Limonite occurs mainly as contact deposits near the edge of the Lower Carboniferous and as an alteration product from carbonates along fissures in the Cobequid mountains. Siderite is present but unimportant. Ankerite in the Londonderry district is the immediate source of the limonite, and by exhaustion of the latter is becoming of value as a flux and as an ore. Used alone it causes irregularity in the furnace.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Slime Concentration.

The Editor:

Sir—Is it to be assumed as possible to construct a slime concentrator which will prove a success with any and all slimes? The matter is one of great practical importance to mill-men. It is quite impossible for a man having to design a mill of moderate size to conduct elaborate experiments on a working scale to determine what class of machine will yield the best results. It is not everyone who has available such resources as those which enabled the Nevada Con. to erect a mere experimental plant which cost as much as most mining companies would be able to expend for their final reduction-works. A few years ago the Wilfley table was brought out as the panacea for all the ills of slime-concentration, but the vanner did not die, as was predicted, and Mr. Wilfley himself was forced to design a 'slimer' which introduced an entirely different principle from the standard type which works so successfully on fine sand. Not only did the vanner refuse to be extinguished, but it is now in the hey-day of a great revival. Is this ascendancy only temporary? Is it not possible that practice may change again? I note that the most common design of vanner has a motion quite different from the old side-shake. An oscillation, in imitation of a true vanning motion, has been introduced. On certain copper ores, and particularly those containing a great deal of clay, this type of machine gives excellent results. But is it not possible to improve on this? It is pertinent to enquire, also, why it so frequently happens that an ore crushed dry will yield better to subsequent wet-concentration than an ore crushed wet. I have found this to be the case in experiences I have had in my own operations, and I have heard others say the same. This seems to me to open up a most interesting field for study. Theoretically, either a fixed table, or a belt moving in one direction only, or one to which an oscillation was communicated, should by perfection of detail yield good concentration. For example, a plain California 'canvas floor', if kept true as to surface, and if of sufficient area, with a suitable dilution of pulp, and a proper inclination of floor, carefully ascertained by experiment for each particular ore, will yield a high efficiency. It may take an excess of water, and involve considerable labor, but I think my point can be sustained, namely, that if the 'commercial mean' be omitted from the problem, practically any type of machine may be so adapted as to yield high technical efficiency. I fancy that, in the majority of mills in America today, concentration of slime is being done along lines that approximate much more closely to a high grade of technical efficiency as regards the system used in each case, than they do to a mean of commercial efficiency such as might be attained by a series of experiments with different appliances. Now

the question in my mind is, whether the floundering that mill-men and engineers alike are compelled to do in their efforts to find a suitable machine for a particular ore, does not indicate lack of scientific study of the problem. Is it feasible to arrive at some standard type of machine for slime-concentration perfected so as to be the one always certain to yield a safe economic result, just as the stamp-mill has become the standard for crushing gold ores? The details of such a machine could then be elaborated to improve its mechanical efficiency. Is this possible? If not, are there then recognizable varieties of slimes, each of which demands some particular kind of treatment? There is no other department of ore-reduction which has lagged so far in the rear as concentration. Efficiencies in recovery of from 85 to 98% are demanded in every other branch of milling and metallurgy, but the concentrator-superintendent who can reach and maintain a recovery of 75% puts a feather in his cap. What is the solution of the problem, or why is it so long in coming?

C.

San Francisco, July 31.

Placer Mining Conditions in Colombia.

The Editor:

Sir—The successful development of the gold dredging industry in the western part of the United States and Alaska has of late years resulted in an active search for new fields offering conditions favorable for this class of mining. Numerous examinations of properties in tropical countries were made and quite a few dredges were installed on rivers in Dutch Guiana, Colombia, Brazil, the Argentine, and in other tropical or semi-tropical countries. Nearly all of these enterprises have been failures, and there has resulted among mining men a prejudice against investment in South American properties. It is the purpose of this short sketch to enquire whether this prejudice be justified.

In the first place, if a man wants to have a coat made, he goes to a tailor; if he wants his garden attended to, he seeks a gardener. If he were to have the gardener make him a suit and the tailor plant his flowers, he would expose himself to ridicule. But I know of more than a dozen cases where for the purpose of examination of gravel properties in tropical countries persons were employed who were no more fit to pass upon their merits than the gardener would have been to manufacture the coat. In one case a school-master was sent to report upon the unsatisfactory work of a gold dredge on one of the tributaries of the Cauca in Colombia, and when the pedagogue had reached the hot and sandy plains of the lower Magdalena at Barranquilla and had learned that before him lay a trip of some 300 miles into the interior, on a little steamer, with all the conveniences of travel omitted, he concluded to pass a couple of weeks at the hotel and return to his lares and penates.

In the report to his company he dwelt upon the possibilities of development and of increased production at the mine, but he took care to dispose of the stock he held in the concern. In many instances men

are selected because they have spent a number of years in the country where the property is situated, or because they have been hydraulic miners, or because they are familiar with the mechanical details of a dredge, or because they have been testing ground with a drill. These qualifications are excellent in their way, but the possession of one, or even more than one, of them does not qualify a man to judge the possibilities and value of a hydraulic or dredge mining property.

Foremost among other features which are important in the consideration of placers in the tropics is transportation. It can be stated, as a general rule, that wherever water or rail transportation to the property is available, the difficulties are not formidable.

If, however, the property can only be reached by trails over mountains, it must be a very rich one to pay for building roads over which to transport the heavy material. No one who has not traveled in tropical countries has an idea of how a heavy rain affects the trails, and how long it takes to restore them to a good condition. I append some figures, which were furnished me by C. Bimberg, of Medellín, Colombia, which are significant. The prices are for the transportation of machinery from Providencia, the terminus of the railroad, to Medellín, a distance of 65 miles, of which the first 40 miles were trail, while the last 25 were wagon-road. They represent extremes in cost.

| Kilograms. | Per carga. | Per metric ton. |
|--|------------|-----------------|
| 150, in two packages on one mule..... | \$ 6 or | \$ 40 |
| 150, in one package on two mules..... | 18 or | 120 |
| 200, carried by peones | 30 or | 400 |
| 300, carried by peones | 180 or | 600 |
| 500, carried by peones (heaviest piece) .. | 300 or | 600 |

At a time when work for the muleteers was slack, a contractor undertook the delivery of a large consignment from Providencia to the Medellín electric light plant at the following figures, and he lost heavily on the contract:

| Kilograms. | Per carga. | Per metric ton. |
|------------------|------------|-----------------|
| 150 | \$ 6.00 or | \$40.00 |
| 150 to 175 | 7.00 or | 40.00 |
| 175 to 200 | 9.00 or | 45.00 |
| 200 to 225 | 9.50 or | 42.20 |
| 225 to 250 | 10.80 or | 43.20 |
| 250 to 275 | 16.20 or | 58.80 |
| 275 to 300 | 22.50 or | 75.00 |

This latter work was done in April and May 1907, at a time when the trails and roads were in good condition, while the previous quotations were figured on a wet season's work.

Another important feature in connection with tropical mining properties is the climatic conditions. As to these, it is a safe rule to expect malarial fevers along the rivers and at low altitudes. This is especially true in Colombia, for the tributaries of the Magdalena river, such as the Cauca, Nechi, and lower Porce.

On the Pacific side, the San Juan seems to be an exception, it being free from malignant fevers. Much depends, of course, on the general health of the person and his liability to infection. While I personally have always been immune from fever in

tropical lands, others might not be so fortunate. The natives, while not severely affected by fevers in their homes, seem to be more readily attacked by them when taken to another part of the country.

Personally, I believe that a thorough sanitation of the country at and around the mining camp can be obtained, as has been done in the case of the Panama Canal zone, so that whenever the property is of sufficient magnitude to warrant the expenditure of a round sum of money for this purpose, the objections on account of climate will carry but little weight.

The importance of the climatic conditions is emphasized by the fact that for any mining enterprise in the tropics, men familiar with the handling of the machinery must be imported from the United States, as there is practically no skilled labor in the tropics.

There is a possibility for an established concern to gradually educate some of the natives so that they can fill more responsible positions, but for the present the fact remains as stated.

In Colombia, property and other rights of foreigners are religiously guarded by all parties, as long as the foreigner takes no active part in politics.

Titles to property are as a rule trustworthy and not likely to be disputed, but as land can be taken up for agricultural and for mining purposes, care has to be exercised to have both these rights, otherwise the owner of the agricultural rights might make trouble, especially if the mine is producing. I knew of one case where a mining company, after having worked out three or four acres of ground, had to pay the owner of the agricultural rights on the land about \$200 per acre. Taxes as a rule are small, as far as the ground is concerned, but an export tax is levied on the product in most of the South American republics, amounting to about 3 to 4% ad valorem.

There is no need to dwell at length on the necessity of observing minutely the physical characteristics of the deposits, as the nature of the installation will depend on them solely. I would only call attention to the importance of viewing each property as a new problem as far as installation is concerned; no fast and hard rules can be laid down. It may become necessary to work out new methods, or at least radical departures from known and approved ones. An installation at such distance from home, if not adequate in every particular, carries with it the germs of failure, and no doubt a great many of the mishaps in the tropics can be traced to the faulty installation or the premature equipping of a property.

Wherever a chance offers for the development of hydro-electric power, advantage should be taken of it, as steam generation by wood in the tropics is unsatisfactory.

So far but little is known as to the actual assay value of the deposits in the rivers and adjacent flats in the South American republics, as, with few exceptions, no attempts have been made to determine in a methodical and painstaking manner such values by drillings, shafts, or other methods.

As far as my personal observations go, and by these I mean results obtained by actual work on comparatively large areas, there are quite a number of properties which will yield from 20 to 30c. per cubic yard, and this, as far as I have been able to ascer-

tain, coincides pretty well with what has been found by others who have investigated the gravels of the Colombian rivers. I have run across properties which have yielded as high as 80c. per cubic yard, but they were of limited extent.

The economic conditions in the tropics are generally unfavorable. Labor, while cheap, is inefficient, the natives are not familiar with the use of tools, and in some localities even a shovel may be an unknown appliance. The food-stuffs obtainable are as a rule unsuited to the palate of the American, and it would become a necessity to import preserved food-stuffs from the United States or Europe, making camp expenses high. Men going into these countries are placed in surroundings entirely unfamiliar to them, the language, the customs of the country, the flora and fauna, everything is strange, and such a state of affairs is likely to produce dissatisfaction, hence frequent changes in the personnel on the property result, unless the equipment is such as to warrant the employment of a large number of Americans all the time, in which event the evil is ameliorated considerably.

It is not a poor man's mining country; it is a place where large installations must be made, and where everything must be done on a large scale. Investors in mining properties in the tropics must always keep in mind that the men at the head of the enterprise must be high-class and will require good remuneration, as they will have to cut themselves loose from their homes for a long period; and the only inducement for a high-class man to accept a position in the tropics is the fact that he receives a better salary than he would for similar work in the United States. A small enterprise cannot afford to pay such salaries. After large companies have established themselves and have shown what can be done, the smaller investments will have a chance of success, but not until then.

L. J. HOHL.

Berkeley, California, June 25.

Postal Rates on Specimens.

The Editor:

Sir—The Postmaster of El Paso, Texas, J. A. Smith, held up samples of ore addressed to the local assayers, on the ground that they should pay first-class sealed-letter rates of two cents per ounce, instead of one cent per ounce, as they had been doing for over 30 years, on the basis of fourth-class matter. The reason for this change given was that there is a line, on the outside of each mailing sack, with the printed words, "Assay for." The shipper fills in this line with the words, silver, lead, gold, or whatever metal he wishes to have determined. It is ruled that if one word is written on the outside of the envelope, although latter is unsealed, first-class sealed-letter rates must be paid. The local assayers complained that it was an undue hardship, not alone on the miners and prospectors, but the assayers also, and that this one-cent rate had been in vogue for a third of a century, in the United States as well as Mexico. Argument was useless, as the Department has decided against the one-cent rate, and from now on two cents per ounce must be paid or else samples will

be held up, unless instructions for assaying are sent by separate letter or postal card.

D. W. RECKHART.

El Paso, Texas, July 28.

[The intent of the law seems to be that any mail package carrying a message shall be charged as first-class matter. A few years ago a ruling was made at Chicago that even a word on the outside of the package indicating the nature of its contents, such as 'photographs', 'merchandise', or the like, subjected it to the payment of first-class postage. This ruling was reversed by higher officials on the ground that the message in such a case was really to the postal officials and designed to facilitate their work, rather than to the recipient. The remedy in the present case would seem to be to send tied rather than sealed bags, and to have sample bags and postal-cards numbered in duplicate. This is being done elsewhere without objection from the postal authorities.—EDITOR.]

The Wisconsin Geological and Natural History Survey, in addition to carrying on soil studies and having charge of highway investigations, both of which are supported by separate appropriations, has under way considerable geological work this season. S. Weidman is continuing his areal survey of the northern part of the State, E. A. Birge is carrying on the biological survey of the lakes and his work on the fish of the State. In addition to his work as chief of the Highway Division, W. O. Hitchkiss is preparing a new geological map of the State and getting the material together for a general elementary bulletin on the geology of Wisconsin. This bulletin will be one of the educational series, planned primarily for use in the high school and by those having no particular training in geology. The construction of a geologic and topographic model of the State is also under way. The mines in the lead and zinc district are re-opening and increasing their production on account of the stronger market for zinc. Considerable exploration for iron ore is going on in the Menomonee district, and the western extension of the Gogebic. There is some activity in exploration for copper in the Keweenawan region, in the northwestern part of the State.

Asbestos of the best quality yet found in the United States occurs near the bottom of the Grand Canyon of Arizona. It is cross-fibre chrysotile of exceptional quality. The outcrop is extensive, but as the product must be packed on donkeys about 12 miles down one side of the canyon and 4000 ft. up the other side, and thence hauled 20 miles to the railroad, only the hand-cobbed, best grade of material can be shipped at present.

Missouri's original coal supply, as estimated by M. R. Campbell, of the U. S. Geological Survey, was 40,000,000,000 short tons, included within an area of 16,700 sq. mi. The production of the State, according to the best records available, amounted at the close of 1908 to 100,935,421 short tons, representing an exhaustion of approximately 151,000,000 tons, or 0.4% of the estimated original supply.

INVESTIGATION OF FERRO-BORON.

By K. IWAI and J. C. BALLAGH.

MINING AND SCIENTIFIC PRESS prize thesis, presented to the President and Faculty of the Colorado School of Mines, June 1909.

The subject of boron in iron and steel has been investigated very little up to the present time. Practically the only investigation upon the subject was made by M. L. Guillet, at Imphy, France.* He started with an electric-furnace alloy made from iron oxide and calcium borate, prepared by Girod, containing C, 2.85%; B, 32.10; S, 0.03; P, 0.005. Two series of steels were made, one with about 0.2% carbon, the other with about 0.5. The analyses of these in percentages were:

| | C. | B | Mn | Si | S | P |
|---------|-------|-------|-------|-------|-------|-------|
| 1 | 0.180 | 0.215 | 0.076 | 0.232 | 0.012 | 0.023 |
| 2 | 0.224 | 0.462 | 0.292 | 0.163 | 0.015 | 0.015 |
| 3 | 0.207 | 0.844 | 0.600 | 0.792 | 0.014 | 0.013 |
| 4 | 0.475 | 0.155 | 0.370 | 0.283 | 0.020 | 0.020 |
| 5 | 0.281 | 1.514 | 0.600 | 0.641 | 0.005 | 0.018 |
| 6 | 0.595 | 0.406 | 0.295 | 0.293 | 0.293 | 0.023 |

Steels with higher amounts of boron than the above could not be forged.

TRANSFORMATION POINTS.—IN DEGREES C.:

| | Heating. | Cooling. |
|---------|---------------|---------------|
| 1 | 750-(830-850) | 720-800 |
| 2 | 780-875 | 750-850 |
| 3 | 780-885 | 740-(905-875) |
| 4 | 775 | 750 |
| 5 | 875-925 | 735-(800-775) |
| 6 | 785 | 760 |

The conclusions are that boron raises the transformation temperatures, excepting that the point A_3 , in cooling, passes a maximum at 0.8% boron, and descends for higher percentages.

Micrography.—After annealing the first series at 900° C., and the second series at 850°, they showed under the microscope no anomalies, except small grains of a constituent which is black with picrate of soda, and polishes white. This may be a borocarbide of iron of variable composition, according to the content of boron and carbon in the steel. When tempered, this special constituent was reduced to traces in the low-carbon series, but was still present in considerable quantities in the higher boron series.

Mechanical Tests.—The annealed specimens showed increasing strength and decreasing ductility as the boron increased, similar to increasing carbon. The tempered specimens showed remarkable increase in tensile strength and elastic limit, however, with decreasing ductility. With 0.8% boron and 0.21 carbon, the properties were:

Tensile strength, 175 kg. per square millimetre, or 250,000 lb. per square inch.

Elastic limit, 130 kg. per square millimetre, or 185,000 lb. per square inch.

Elongation, 4 per cent.

Reduction of area, 10.6 per cent.

These results are most surprising, considering the low carbon. Another unexpected property is that the resistance of this steel to shock is double that of normal steel. The higher-carbon boron-steels were practically worthless after tempering. All the low-

carbon steels after tempering worked well under the cutting tools. All things considered, 0.22 carbon with 0.5 boron, as in steel No. 2, makes the best combination for industrial purposes. It is important to remember that these steels are practically useless in the normal state or forged, but possess these remarkable mechanical properties only in the tempered condition.

Considerable time has been spent by the authors in the design and construction of a suitable furnace, capable of close regulation both as to temperature and chemical reactions involved; and owing to the limited amount of time and facilities at their disposal the only things tried after the completion of the furnace were the manufacture of ferro-boron and the microscopic examination of the products obtained. The writers wish to express their thanks to W. G. Haldane, professor in the Colorado School of Mines, for valuable assistance given by him during the experiments. New difficulties arose at each succeeding experiment; these were gradually overcome until in the last few runs of the furnace results were obtained that were very gratifying. The difficulties met were more of a mechanical nature in connection with the operation of the furnace than in the analytical or metallographic work.

For the production of ferro-boron by the direct reduction of oxygen compounds of iron and boron the indirect arc furnace was decided upon as the most easily managed and the best suited for the purpose. The body of the furnace was constructed of ordinary fire-brick. For the lining several materials were tried and rejected. Finally magnesite brick was decided upon as being by far the most refractory material available. They do, however, crack under the influence of heat, and at the high temperature used are easily attacked by the silica in the charge. The dimensions and details of construction are shown in Fig. 1. The electrodes used were made of Acheson graphite; size, 1½ in. diam.; current-carrying capacity, 1000 amperes; loss by weight, seven experiments, 230 grams; loss in length, 5 inches.

In the lining experiments the magnesite used was the commercial magnesite powder made by precipitation. This is an impalpable powder and is probably finer than 100-mesh. The experiments were as follows:

1. The magnesite was mixed with enough hematite to give a slightly pink mixture. Enough water was added to make a mixture without cohesion unless pressure were applied. Between this lining and the silica bricks on the outside was placed a thin layer of paste made by mixing powdered graphite with molasses and water. This was allowed to dry for a week, and was then slowly heated with a gasoline torch before the arc was started. Under the heat of the torch this lining crumbled, and under the heat of the arc it cracked and became a powder.

2. The magnesite was mixed with a small amount of tar, about one part tar to four parts magnesite powder. This was heated in a muffle to full red heat. The tar burned off, leaving the magnesite in the form of a powder again.

3. The magnesite was mixed with an equal vol-

*'Les Aciers au Bore', Revue de Metallurgie, Aug. 1907.

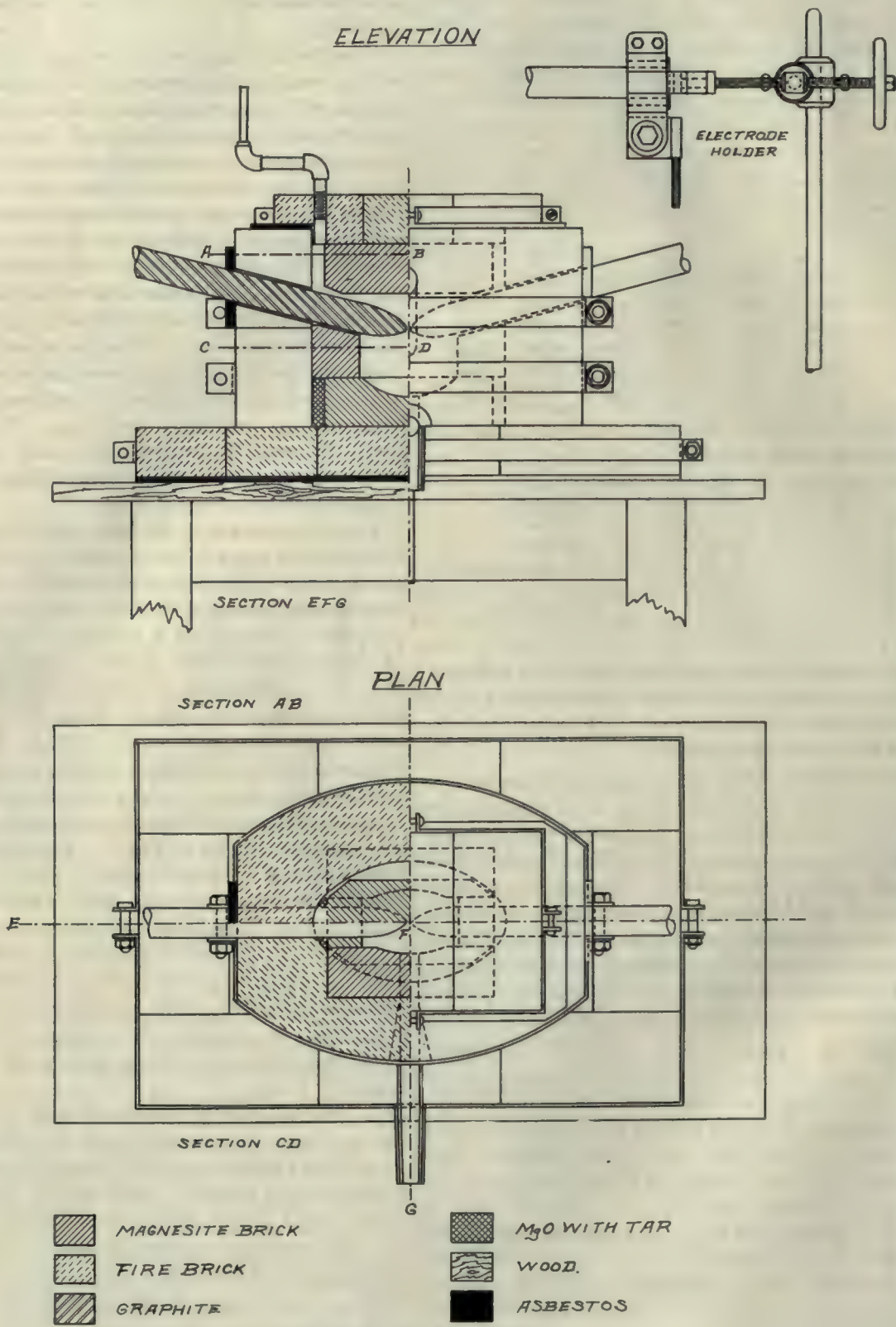


FIG. I. EXPERIMENTAL ELECTRIC FURNACE.

ume of tar. Under oxidizing conditions in the muffle the tar burned off, leaving the magnesite in the form of a powder. Under reducing conditions in the muffle the tar was converted into a coke, and left the magnesite in a porous condition.

4. The magnesite was mixed with $2\frac{1}{2}\%$ of basic slag, with a small amount of water. When heated to full red this became a powder.

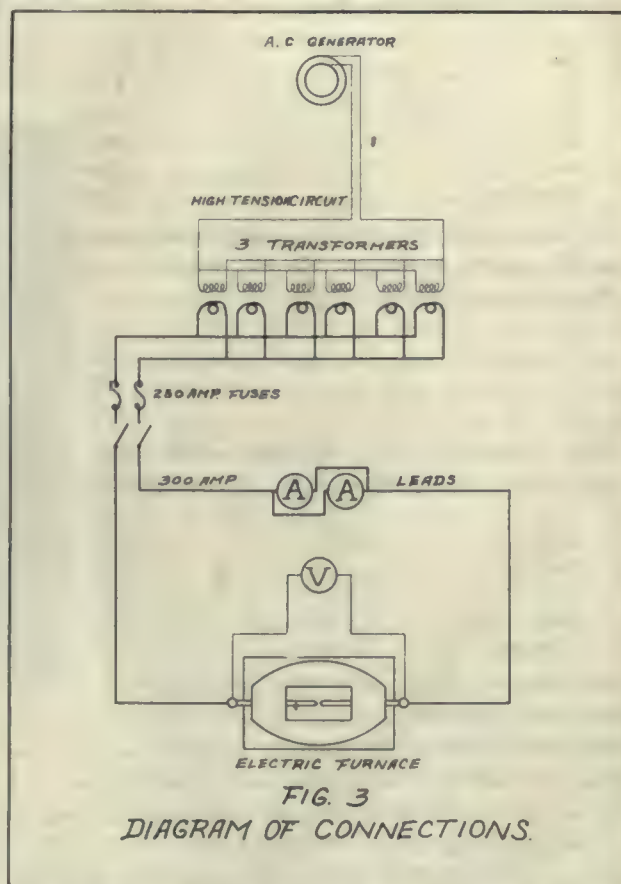
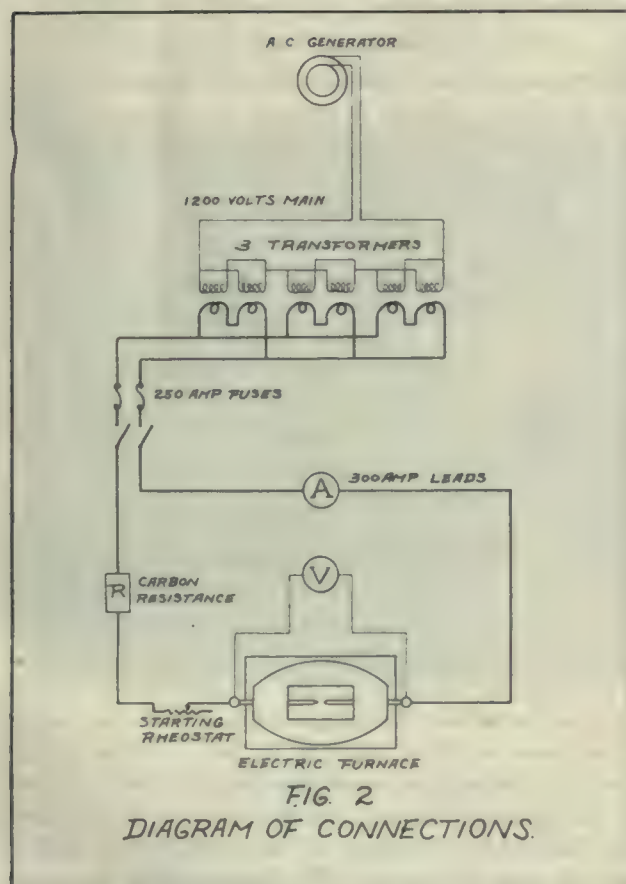
5. The magnesite was mixed with 10% of basic slag and a small amount of water. When heated to full red this became a powder, as in No. 4.

6. A fairly thick solution of water-glass (Na_2SiO_3) was mixed with an equal volume of water and two volumes of the magnesite powder. This was dried and heated to full red. A few cracks formed, but the body was firm.

furnace while hot, and, after cooling, heat was gradually applied. The carbon burned off gradually, giving a dense smoke. When the carbon had burned off, the magnesite again became a powder. Below the surface, where the air had not entered, the mass was hard.

From these nine lining experiments the conclusion seemed to be that the magnesite in itself is refractory enough, as it did not fuse in any of the trials, but a suitable binder for the precipitated variety is the main drawback to its use. Powdered magnesite will shrink to a certain extent under the influence of high heat, and this fact also renders the finding of a bond more difficult.

An experiment was then tried, using commercial magnesite brick, such as is used in the basic open-



7. A fairly thick solution of water-glass and two volumes of magnesite were mixed without water other than in the water-glass. This formed a very moist mixture. It was dried and heated to full red for a half hour. The surface was firm and without cracks, except a few minor ones at the contact of the holding vessel and the mixture.

8. Water-glass and enough of the magnesite powder were mixed to get a mass that would not cohere unless a small amount of pressure were applied. As in No. 7, this was heated to full red for a half hour. The surface was firm and without cracks. This was the lining used in Experiment No. 2 in running the furnace. It gave way under the arc and was reduced to a powder as in the previous trials. This kind of lining also proved to be of no use.

9. The magnesite was mixed with enough liquid refined coal tar (containing 5% vaseline) to make a dense pasty mass. It was rammed in place in the

hearth furnace, obtained from the Colorado Fuel & Iron Co. The outer wall was cut away, leaving enough room for one brick at the base, one at the side, two small end-pieces, and a cover of one brick, as shown in Fig. 1. The joints were made as tight as possible by rubbing, and at the contact they were rubbed with a thin paste made from the powder obtained in working the bricks to shape, mixed with a small amount of fire-clay. Between these bricks and the outer fire-clay bricks was placed a layer of the magnesite powder used in the previous experiments. This was used to keep the joints of the set tight, by ramming in between the basic lining and the outer fire-clay casing. It also would stop any metal that might leak through the cracks in the lining. These bricks were worked by hand until the desired shape of the interior of the furnace was obtained. The cubical content of the furnace was in this way reduced to 62 cubic inches.

In the electrical equipment, the generator used was a General Electric Co. A. C. of 30-kw. capacity at 1150 volts full load. The three transformers were made by the General Electric Co., with a capacity of 10 kw. each. They were connected as described under the experiment and as shown in Fig. 2 and 3. They are type H. The volt-meter used was a Cardew's hot-wire type of instrument, and was calibrated before the experiment for voltages between 30 and 40. The ammeters were made by the Westinghouse Electric Co., and each read up to 300 amperes. In the last three experiments there were two ammeters connected in parallel, so that each instrument read half of the current going through the circuit.

The iron ore used was obtained from the Colorado Fuel & Iron Co.'s Sunrise group of mines, Laramie, Wyoming. Its analysis was:

| | % |
|----------------|-------|
| Fe | 66.6 |
| P | 0.053 |
| Si | 1.928 |
| S | 0.026 |
| Mn | trace |
| Moisture | 0.045 |

The steel was the basic open-hearth variety, obtained from the Colorado Fuel & Iron Co., and was of the following composition:

| | % |
|---------|-------|
| C | 0.25 |
| S | 0.056 |
| P | 0.057 |

The colemanite was obtained from the Pacific Coast Borax Co., of New York. Its composition was:

| | % |
|--------------------------------------|-------|
| B ₂ O ₃ | 27.23 |
| CaO | 28.80 |
| H ₂ O | 25.30 |
| Fe ₂ O ₃ | trace |
| Insoluble | 0.74 |

The determination of boron, especially when combined with various metals, is very difficult, and at best is only a partly satisfactory approximation. The apparatus for the determination is as follows: A long wide-necked 200-c.c. Kjeldahl flask is used as the decomposing flask. This flask is fitted with a stopper carrying three tubes, one connected to a condenser, one connected with a flask for supplying a current of methyl alcohol vapor which is to be conducted to the bottom of the decomposing flask, this serving to keep the mixture agitated and to avoid bumping during the distillation, the third tube serving to introduce the methyl alcohol needed to form the mixture of the substance, methyl alcohol and sulphuric acid. This last tube is fitted with a clamp at the top. One to five grams of the dry finely pulverized sample is placed in the decomposing flask. A sufficient amount of sulphuric acid is added to form a thin paste, and the flask heated gently to expel carbon dioxide and volatile acids. This is then cooled. About 50 c.c. of water is placed in the receiver, the terminal tube of the condenser being made to dip into the water. The decomposing flask was then connected with the flask for the generation of methyl alcohol vapor, and with the condensers, all connected parts being made air-tight. The distillation was started by adding in one portion to the decomposing

flask sufficient cold methyl alcohol to equal in amount about twenty times the amount of free sulphuric acid present. A few cubic centimetres of hydrogen peroxide are also added. The methyl alcohol vapors are then passed from the generating flask until the boron has all gone into the receiver. This will take from 30 to 60 minutes. During the distillation the flask is heated to a temperature sufficient to prevent any marked change of the volume of the methyl alcohol which was originally added. The distillate is then neutralized with alkali, when necessary, and an amount of neutral glycerine equivalent to at least one-third the volume of the solution at the finish is added, together with about ½ c.c. phenolphthalein as an indicator. The titration is then finished with standard sodium hydroxide solution, which must be free from carbonates. The calculation is based upon the following equation:



Experiment No. 1 was the first run of the furnace, and the object was to determine the voltage across the arc, and to see how the lining would withstand the temperature of the arc. For these reasons no charge was placed in the furnace. The transformers were placed in series parallel to give a 30:1 transformation. The voltage across the arc was 20, with a current of 175 amperes. The length of the arc was not over ⅛ in. at any time. There was no permanent resistance in the circuit, but a starting resistance, made of a jar of salt-solution, was placed in series with the circuit. After the arc started this was cut out. The time of the run was 45 minutes, and at the end of that time the lining was destroyed. The effect on the lining is explained in the lining experiment, trial No. 1. A preliminary heating of the furnace was obtained by means of a gasoline torch directed through one of the electrode holes. From this experiment it was found that a suitable lining must be obtained before a run could be made.

Experiment No. 2 was performed with the same connections of the circuit as in No. 1. The lining was the water-glass lining described in trial No. 8 of the lining experiments. On the bottom of the furnace was placed a piece of steel billet, the object being to melt this steel. The furnace with the steel was pre-heated by means of the torch to dull red, and the arc was then started. After a run of one hour an attempt at tapping was made, which was a failure as far as securing any metal was concerned. After the furnace had cooled it was opened and the piece of steel was found to be partly fused. The voltage and current were the same as in experiment No. 1. From this experiment it was found: (1) That the voltage used was too low to obtain a temperature high enough to cause the steel to melt within a reasonable time. This could be altered by changing the connections at the transformers. (2) The necessity of some resistance material in the circuit to keep a steady arc. (3) The chamber of the furnace was too large for the arc used, owing to too great radiation of heat. (4) A more efficient lining should be obtained.

Experiment No. 3 represented a trial of the magnesite-brick lining, using a piece of open-hearth steel alone, the object of the experiment being to melt

this steel. Fusion was noticed to a slight extent in about 20 minutes. The metal could be seen 'teeming' through the peep-hole. The pour was made in one hour from the time the arc started. The ingot obtained was very rough, due to the too rapid cooling in the mold. The walls of the furnace were not affected to any extent by the high temperature nor by the contact with the metal. On the sides were many globules of metal that had been thrown up during the boiling of the metal.

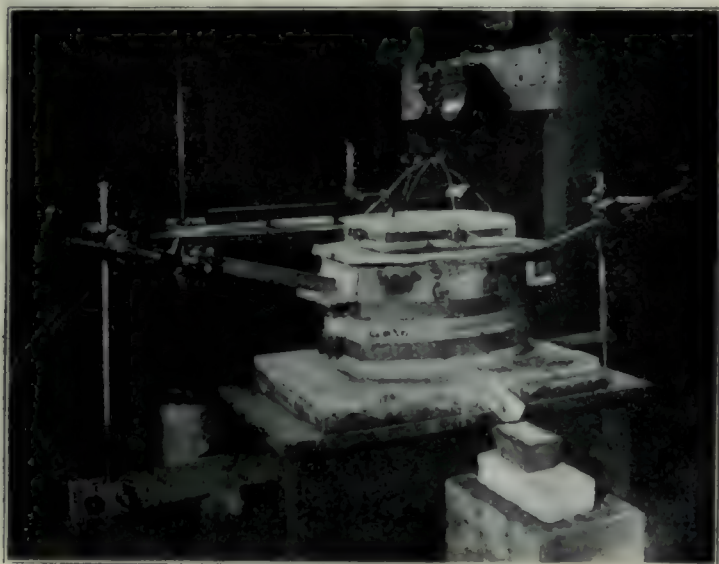
From this experiment it was found, among other things, that: (1) There must be some regulating device by means of which the electrodes would stay the same distance apart, thus keeping a constant arc. (2) The mold should be heated before pouring, in order that the cooling should not be too sudden. (3) Careful watch should be kept to ascertain when fusion takes place. The longer the steel is in contact with the arc the greater the opportunity for the absorption of carbon by the steel. If kept in contact

to incandescence. Fusion was noted in $1\frac{1}{2}$ hours, and the pour was made 2 hours after the start. The exact time of fusion could not be determined, due to the irregularities of the arc at the start and the cooling of the charge while several burned-out fuses were being replaced. In this experiment the carbon resistance in the circuit did not become as hot as in No. 3, due to the fact that several bars of iron were imbedded in it to help its conductivity. As in No. 3, the starting resistance was not used. When complete fusion was noted by the 'teeming' surface, seen through the peep-hole, the fire-clay plug was driven out by means of a small iron rod, after the tap-hole and mold had been heated with the gasoline torch. The rod used in tapping was too small, and the stream of metal after coming part way out of the tap-hole 'froze' and blocked the further passage of the metal. It was necessary to allow the furnace to cool and partly dismantle it in order to clean out the solidified metal and charge in the tap-hole. Under

normal conditions the current was 175 amperes and the voltage across the arc was 50. The temperature was determined by means of the Wanner optical pyrometer through the peep-hole. A reading was taken before and after the attempt at tapping. In the first case the reading was taken while the arc was on, and in the second case after it was shut off. Both of these readings were 1368°C . The lining was much corroded, and where it was in contact with the charge was eaten into to a depth of nearly an inch. The bricks were covered with cracks, most of which were too small to be of any account. The brick was of a lighter color at the contact with the charge than elsewhere, and appeared to have absorbed some material to a depth of nearly $1\frac{1}{2}$ in. This was probably the slag, as there was practically none present on the metal. In this experiment the conclusions arrived at were:

(1) The tap-hole should be of ample size, and have a fairly steep angle. The gutter to the mold should not be too long. This tap-hole should be heated as high as possible before tapping is commenced. (2) As large and strong a tapping-bar as possible should be used so that a large stream of metal can flow at once after the opening has been made. (3) The carbon used should be in a form having a higher ignition-point than charcoal. Coke would naturally suggest itself. (4) A circuit-breaker of easy manipulation should be within easy reach of the operator, so that in case of a blow-out of the fuse or breaker there would be little opportunity for the furnace to cool down. (5) That too much resistance was in the circuit. (6) That the temperature was not high enough.

In experiment No. 5 both the primaries and the secondaries of the transformers were placed in parallel, as shown in Fig. 3, to produce a higher temperature. The carbon resistance used in the last experiment was cut out, and the run made without any resistance in the circuit other than that of the arc and leads. A preliminary heating of the furnace was made by means of the torch, and a run of the arc.



Furnace Used in Experiments.

with the arc too long the fused metal will boil and spatter steel on the sides, top, and electrodes. The loss of metal by air drawn in through the electrodes is greatly augmented by the increased length of time, and suitable devices should be provided for maintaining a neutral atmosphere.

Experiment No. 4 was an attempt to produce ferro-boron. The charge consisted of hematite, silica, colemanite, and charcoal, all ground to 80-mesh and thoroughly mixed. The charge was carefully calculated to produce a ferro-boron containing 50% boron, together with a monosilicate slag. It was added to the cold furnace, and the arc started without preliminary heating, the object being to avoid as far as possible the burning of the carbon of the charge. At the start the arc was unsteady, probably due to the cooling action of the walls in such close proximity. A wooden rod connected the electrode holders across the furnace and kept the electrodes at a constant distance apart. For the first 45 minutes much carbon monoxide was given off. This burned at all available cracks, and in the first part of the run showed fine particles in the flame; these were probably fine carbon particles from the charge, heated

The current was 250 amperes, and the voltage 35. The charging was done from the top, between the electrodes, and the cover put on as quickly as possible. In this run two charges were tried.

Charge No. 1; colemanite. This fusion was made in 30 minutes, and a small amount of metal obtained, but no slag.

Charge No. 2; colemanite. This fusion was also made in 30 minutes. A white powder came out with the carbon monoxide gas, probably due to the decomposition of the colemanite. From this experiment it is seen: (1) That the colemanite should be calcined. (2) That the charge should be put into the furnace in such wise as to keep the carbon from burning up before the furnace can be closed. (3) The coke burned off as quickly as the charcoal, consequently charcoal has an advantage over coke in its purity.

In experiment No. 6 the charge was fed in two portions, ten minutes apart. The total time of heating with the charge under the arc was 30 minutes. A preliminary heating of the furnace was effected by running the arc for 30 minutes. The product tapped was quite thick. Much slag accumulated, probably due to the fact that the brick lining had become saturated with slag from the previous runs. This was the most successful run so far. It demonstrated: (1) that a better heating of the tap-hole should be effected; (2) that the slag was too basic, consequently more silica was required in the charge; (3) that the charge should be coarse enough to prevent great loss; (4) that quite an excess of carbon is required in the charge.

In experiment No. 7 no preliminary heating of the furnace was tried; no resistance was used in the circuit, and the arc was constant from the beginning of the run. The voltage was 35, and the current 230 amperes. Two charges were tried, one for the formation of ferro-boron from steel and colemanite, and the other using a charge similar to that used in Experiments No. 5 and 6.

Charge No. 1. The steel block was placed in the furnace and the arc started. Fusion of the steel took place in 25 minutes, and the colemanite charge was added. After 20 minutes the charge was tapped off into a mold that had been previously heated with the gasoline torch. The tap-hole had also been to a red heat, so there was no trouble in the tapping of the product. The metal and slag obtained separated nicely.

Charge No. 2. The charge consisted of the colemanite and charcoal charge, similar to the previous experiments. There was enough used so that the metal obtained would be greater in amount than that obtained in the previous runs. The charge was added in three portions, 10 minutes apart. The total time to melt down was 40 minutes. The product obtained was greater in amount than that obtained in any of the previous runs, and was of a uniform quality. This was the best run made to date, both in regard to the operation of the furnace and in regard to the products obtained. After this run the furnace was torn down, and on the bottom was found 208 gm. of metal. This was the accumulation from the above two runs, as the furnace was clean at the

start. Therefore the loss in the above two runs cannot be told, as part of this metal may have come from each charge.

From experiment No. 7 it was determined that no preliminary heating of the furnace is required.

Details of experiment No. 7 are as follows:

| Charge No. 1. | Grams. |
|--|--------|
| Steel | 1,130 |
| Colemanite | 130 |
| Silica | 20 |
| Voltage | 35 |
| Amperes | 230 |
| Time (total), minutes | 45 |
| Metal obtained, grams..... | 892 |
| | % |
| C | 1.13 |
| B | 0.28 |
| Si | 0.046 |
| Slag obtained, grams..... | 150 |
| Slag analysis. | % |
| B ₂ O ₃ | 13.70 |
| FeO | 3.07 |
| CaO | 16.10 |
| SiO ₂ | 18.22 |
| Al ₂ O ₃ | 11.36 |
| MgO | 32.35 |
| Insoluble (other than SiO ₂) | 0.72 |

Microstructure of the metal is shown in Fig. 4.

Charge No. 2. For 10% ferro-carbon.

| | Grams. |
|------------------------------------|--------|
| Iron ore | 500 |
| Colemanite (partly calcined) | 390 |
| Silica | 70 |
| Charcoal | 200 |

Fineness of charge, through 8-mesh on 30-mesh.

Time, 40 minutes, charging three times.

Current and voltage same as in Charge No. 1.

| | |
|--|-------|
| Metal obtained, grams | 103 |
| | % |
| C | 1.82 |
| B | 0.75 |
| Si | 0.92 |
| Slag obtained, grams | 650 |
| Slag analysis. | % |
| B ₂ O ₃ | 11.86 |
| FeO | 14.26 |
| CaO | 12.94 |
| MgO | 39.36 |
| Al ₂ O ₃ | 3.92 |
| SiO ₂ | 13.70 |
| Insoluble (other than SiO ₂) | 0.16 |

Microstructure of the metal is shown in Fig. 4.

The metallography of the products is as follows: the metals obtained from experiments No. 5, 6, and 7 were very brittle, and were hard enough to cut glass. They had a conchoidal white fracture, and a close-grained structure. No peculiarity of structure was noticed under the microscope, but the presence of a solid solution of iron-boron-carbon was observed as shown in Fig. 4, 'A'. After re-heating and quenching at a temperature of 800-900° C. the round grains disappeared as shown in Fig. 4, 'B'. The brittleness also disappeared. This accords with the result of investigations made by M. Guillet.

All of the sections were etched after polishing with a 5% ethyl alcoholic solution of picric acid.

Fig. 4 'A'. Metal from experiment No. 6, charge No. 1. The dark parts are pearlite, and the ground-mass is cementite. The round grains are presumably solid solution of iron-boron-carbon.

Fig. 4 'B'. This is the same section quenched at 800-900° C., and under the glass shows the rounded grains to have disappeared. The hardness and brittleness were also eliminated as indicated above.

Fig. 4 'C'. Metal from charge No. 1, experiment No. 7. The dark part is pearlite, and the white part is cementite. No indication of a solid solution as in Fig. 4 'A'.

Fig. 4 'D'. Metal from charge No. 2, experiment

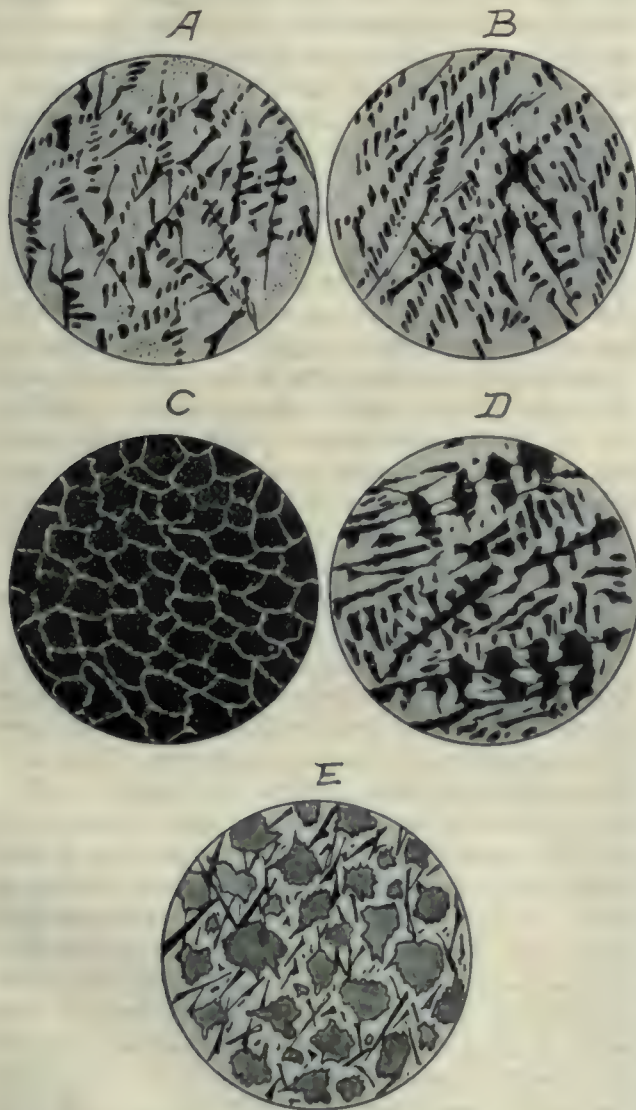


Fig. 4. Microstructure of the Metal.

No. 7. The dark part is pearlite, and the light part is cementite. No solid solution was visible, and the ratio of pearlite to cementite checks closely the chemical results for carbon, hence the conclusion that the boron in this instance is contained in the eutectic of probably ternary type.

Fig. 4 'E'. Metal from charge No. 1, experiment No. 5. This section showed many blow-holes which interfered with the examination to such an extent that the constituents could not be identified.

Conclusion.

1. According to the experiments performed, ferro-boron can be made in the arc-furnace by the direct reduction of iron ore and colemanite with a limita-

tion of 1% boron in the metal, using the temperature and charges available in these experiments.

2. Charge No. 1 of experiment No. 7 proves that, at high temperature, colemanite, when heated in contact with molten steel, gives up some of its boron to the steel, forming a ferro-boron.

3. The avoidance of a loss of boron in the slag is an important factor in the production of a high ferro-boron.

4. From the analysis of the slag it is seen that at a high temperature magnesium oxide has a higher affinity for silica than either calcium oxide or ferrous oxide. This means that magnesite is not good as a permanent lining for this operation unless the charge is changed.

5. If anhydrous borates are used it would seem that a higher boron-content would be obtained.

6. No special resistance is required in an alternating current circuit to obtain a steady arc unless the resistance of the circuit is very small. There seems to be no difference in the operation, whether the furnace is pre-heated or not.

7. Closer regulation of the carbon content would give more satisfactory results for metallographic investigation.

The Grant's Pass region of Oregon has recently been studied by J. S. Diller and G. F. Kay of the U. S. Geological Survey. The region covers about a thousand square miles, and has produced considerable amounts of gold and copper, the total mineral production in 1907 being valued at nearly half a million dollars. It is mountainous, and ranges in altitude from about 871 to over 7043 ft. above the sea. The fertile valleys are farmed and the mountains are generally well forested, especially in the southeastern portion, which belongs to the Siskiyou National Forest. The region is reached by a stage mail route, which follows Applegate river to the crest of the Siskiyou mountains in California. The most productive gold-quartz claims in operation during the summer of 1908 were the Braden and the Opp. The Granite Hill and Mountain Lion mines, although not now being worked, have also been fairly important producers within the last few years. There are many mines and prospects on which work is not now being done, some of which have never produced, some of which have produced ore worth a few hundred dollars, and a few which have yielded as much as several thousand dollars. Some development is in progress on new prospects and on mines which were until recently closed. The total production of the gold-quartz mines in 1907 was about \$70,000.

West Virginia's total production of coal to the close of 1908 amounted to 476,096,382 short tons, equivalent to an exhaustion of 715,000,000 short tons, according to E. W. Parker. Estimates by I. C. White, State Geologist, and M. R. Campbell, of the U. S. Geological Survey, based on recent study of the coal-fields, place the original supply in West Virginia at 150,000,000,000 short tons. The apparent supply now available therefor amounts to 149,285,000,000 short tons, about 3500 times the production of 1908 and 2400 times the exhaustion represented by that production.

SMELTER VERSUS OIL FUME.

Written for the MINING AND SCIENTIFIC PRESS
By EUGENE B. BRADEN.

The general public, which has only a hazy notion about mining and smelting matters, outside of the stock market, seems to feel that smelting plants are a common nuisance. As to their benefit and absolute necessity to the great mining industries of the country, the public seems to have little knowledge, and to care less. There should be a better understanding of the subject, since the interests involved are so great, not only in annual monetary output, but in the matter of the large investments at thousands of mines, and in the number of men employed in the various fields. The closing of any large custom smelter would result also in closing a great number of widely scattered mines. Therefore the operation of a smelting plant is not a mere local question. It is not every mining company which can afford to erect a reduction plant to handle its own ores, and even those which have mills for crushing ore must finally have their concentrate worked at the smelter. The sulphide concentrate is always of more value per ton than the ore which is milled.

In California last year the quartz mines yielded and milled 1,654,000 tons of gold ores, which yielded an average of \$5.71 per ton in gold and silver at the mills on the plates. From this ore was saved by concentration 32,000 tons of sulphides, which was sent to the smelter and yielded over \$50 per ton, thus adding to the original value of the ore, but which had to be smelted to be utilized. In addition, there were 375,000 tons of ore smelted in the State. In Nevada, in the same period, there were 436,000 tons of ore milled, yielding an average of \$9.58 per ton, but the concentrate saved and smelted was worth \$63 per ton. In addition, Nevada had 200,000 tons of ore which had to be smelted, and which yielded \$57 per ton. In these two States, therefore, California and Nevada, if smelters had not handled the concentrate and smelting ores, the miners would have made a mighty poor showing for their work. It will be noted that the concentrate and the smelting ore were the most valuable products of the mines, yet the mills alone could not treat these.

It may thus be seen that to mine for gold and silver profitably there must be smelters to handle certain portions of the product. Copper and lead ores must all be smelted to get the metal. Moreover, when either placer or quartz gold miners get out their gold, it must be refined, and this is mainly done by the smelting companies which have refineries in their plants. When a miner sends his gold down he can get the cash for it in two days, before the refined gold is sent to the mint to be coined. The smelting plants in Shasta county, which handle copper ores and turn out from 6 to 7 million dollars' worth of metal yearly, are owned by companies which have mines of their own. Some gold and silver ore is bought from quartz miners, however, to mix as flux with the copper ores. The only large custom smelting plant in the State of California is that of the Selby Smelting & Lead Co., of San Francisco, with smelting works near Vallejo Junction, on Carquinez Straits, at the head of San

Pablo bay. By a custom plant is meant one which works ores or bullion sent to it by anyone for a specified charge. This plant handles large quantities of material, not only from the Pacific Coast States, but from Canada, British Columbia, Mexico, the Central American States, and South America. Eventually all the Klondike and Alaska gold comes to this city, and a certain proportion is handled by this company. Base lead bullion is also sent for refining from Washington, British Columbia, etc. Last years these works handled an amount equal to one quarter of all the gold produced in the United States, or upward of \$25,000,000. Its output of gold, silver, and lead that year was over \$35,000,000. This year there is a marked increase. It may surprise many to learn that last Month, June 1909, the Selby company turned out \$4,000,000 in gold, 1,500,000 oz. silver, 5,400,000 lb. of pig-lead, 500,000 lb. of white lead, 200,000 lb. of sheet-lead, 225,000 lb. of shot, 300,000 lb. of copper sulphate, and 3,000,000 shotgun shells, besides several minor by-products. The great industrial importance of this plant is thus manifest. About 500 men are directly employed, with a payroll of over \$500,000 per annum, and indirectly about 3000 persons are dependent on the operation of this extensive plant. The Selby plant is really a clearing-house in California for the precious metals produced in this State and the surrounding ones, as well as the foreign countries on the Pacific Coast.

Notwithstanding the vast interests involved, if twenty or thirty farmers in Solano county and the citizens of the small town of Benicia are listened to, this institution may be closed indefinitely. The cities of Los Angeles, San Diego, and Seattle have for years been trying to get a similar plant established near them for the mining business it brings, because those cities would thus become mining centres. They have offered large bonuses to bring this about. In fact, had it not been for the Klondike and Alaska mines, and the resultant gold and trade it brought, Seattle might have continued to be a small place, instead of trying to rival San Francisco as a great Pacific port. While the Selby plant is about 30 miles from San Francisco, the main offices of the company are in the city, where the business is handled, the gold and silver coming to the local mint for coinage, and the manufactured products being sold here. Thus it is decidedly a San Franciscan institution.

The cause of complaint against the smelting company on the part of the Solano county farmers and the citizens of Benicia is the smoke coming from the stacks of the plant on the Contra Costa county shore. They have succeeded in obtaining an injunction limiting the working of the plant in certain months each year, and within a month the matter comes before the courts for final action. The company has expended over \$100,000 in improvements to prevent possible damage from fume, and has entirely eliminated the elements originally complained of. Its contention now is that the unpleasant odors experienced at Benicia do not arise at the smelting plant, but come from the refining of crude California oils and the manufacture of asphalt from these oils, by other concerns.

The history of the present litigation, in brief, is

that in 1905 certain Solano county farmers brought suit for loss of horses killed by feeding on plants on which fume from the smelter had settled. These suits were brought prior to the time the present owners of the Selby plant took it over, and were satisfactorily settled. When the present company took hold, it started to build a 'bag-house', but work was delayed by the disaster of 1906, and the cotton bags first used did not satisfactorily arrest the escaping lead fume. Finally woolen bags were substituted, which are perfectly satisfactory and serve the purpose. Prior to the erecting of the bag-house, early in 1908, certain lead particles were undoubtedly emitted into the atmosphere, but the particles of lead are now mechanically precipitated into compartments below, together with the carbon resulting from the use of coke in the blast-furnaces. There is absolutely nothing now escaping into the surrounding country which could prove a detriment to animal or vegetable life.

But there was still another source of annoyance. The Selby company refines its 'dore' metal (gold and silver bullion) by what is known as the sulphuric acid process. The gold and silver are placed in large iron pots with sulphuric acid, and on heating, the silver goes into solution with the sulphuric acid, and the gold is precipitated, gathered up, and made into fine bars. The silver is subsequently precipitated by using copper plates. In this boiling process a dense fume of sulphuric acid is thrown into the air, and it will be remembered by passengers on the Southern Pacific road when passing through Vallejo Junction, that the effect of this fume was felt. These are of the same character as those formerly given off from the U. S. Mint in San Francisco. The apparatus invented by F. G. Cottrell, of the University of California, has for the past year entirely eliminated this feature of the alleged nuisance. This electrical contrivance precipitates the sulphuric acid fume within the works, and nothing now escapes, whereas formerly dense clouds were emitted into the atmosphere.

Coming now to the stack from which the roaster fume is emitted, it is claimed by the Selby company that the fume will not and does not damage the surrounding country. The fume comes from the furnaces in which are roasted the sulphide concentrate from the gold-mills along the Mother Lode and other parts of this and neighboring States. The concentrate contains sulphur, and in order to put it into condition to be smelted in blast-furnaces and to recover the gold and silver, it is necessary to drive off this sulphur by roasting. The type of roaster used is the Ropp, and is continuous, that is, the ore is continuously fed into it, and is turned over and over by moving plows or rabblers, so that the heat can reach all portions and set the sulphur free. This done, the material is otherwise treated. The particular type of roaster in use at this plant admits large quantities of free air, so that the sulphur fume emitted from the stack is in a more dilute condition than the fume coming from any other roasting operation in this country. Various experts have made exhaustive tests, so it is believed that no damage can result.

Careful investigation in the neighborhood of the plant from 100 yards to five miles distant, reveals absolutely no damage to shrubbery or to growing crops. In the injunction issued by the local court in Solano county, at the instance of the people of Benicia, no claim of injury to crops was made. The plea was that the fume was a nuisance, nauseating, and generally objectionable. In the latter part of May, 1908, it was arranged with certain Benicia citizens, in order to determine if the Selby plant was the cause of their trouble, to close the plant. This was done, and even the fuel oil used at the boilers was shut off, so there was not one atom of smoke of any kind escaping from the stacks on May 30. The next morning, however, there was great complaint at Benicia, and statements were taken from 27 prominent citizens to the effect that the smelter must be running, as they smelt the fume. They were invited to visit the plant to see that it was really closed. Again on July 28 nauseating fume was detected at Benicia, but the citizens who came to the smelter found that the roasting furnaces had been closed for four days. Some who visited the plant found the noxious odor coming from the windward of the smelter. Considering the affidavits submitted by the residents of Solano county, the fume which had been troubling them was again noticed in the latter part of August, but during this period the roasters of the Selby plant were not in operation, and nothing but the smoke from burning oil was escaping from the roaster stack. The Selby plant was again closed during the latter part of May, this year, yet complaints were regularly made by people experiencing discomfort from fume supposed to come from the Selby works, though no fume was emitted, the roasters not being in operation.

Tests made by experts on the gases escaping when asphalt is being manufactured from crude petroleum show that these gases are at least 4000 times as strong as sulphuric acid gases. That is, given a definite quantity of sulphurous acid gases, in a closed room, the experts are able to detect, by the sense of smell, one part in 150,000. Given a definite quantity of gases coming from the distillation of crude oil in making asphaltum, the experts are able to detect, by the sense of smell, one part in 60,000,000. It has therefore been demonstrated that the gases made in distilling crude oil are 4000 times stronger than those from burning sulphur ores. It is also calculated that 30 lb. of these gases given out in the distillation of oil will be perceptible in a volume of air 2000 by 500 ft. and 5 miles long, equivalent to the burning of 25 tons of ordinary concentrate; but it must be remembered that this sulphur must be evolved in a single instant to produce the same effect as the 30 lb. of gases given out from the oil, which is an utterly impracticable thing to do.

During many hours out of each 24 no complaint is made by citizens of Benicia; it is usually made during the early hours of the morning, although the velocity and direction of the wind has not changed. No complaint is made at other periods of the day, either at noon, at 3, at 6, or at 10 p. m. Yet the Selby roasters during all that time are emitting the fume of sulphurous acid in a diluted state. If the fault

lay with the Selby plant there should be continuous cause of complaint while the wind blows in that direction. It is, therefore, justly contended that the source of the trouble should be sought elsewhere. The atmosphere on the beach at the Pacific Ocean is free from sulphurous acid, but tests made in San Francisco, Oakland, and Berkeley show that the amount of sulphurous acid in the air is constantly increasing. Immediately to windward of the Selby plant, during the prevailing winds of the summer months, the atmosphere shows practically the same quantity of sulphurous acid gases as at the city of Benicia, $5\frac{1}{2}$ miles distant, which is to leeward of the Selby plant. In any community where sulphur is burned the atmosphere becomes contaminated. In the city of New York it has been shown that fully 1300 tons of sulphurous acid gas are evolved into the atmosphere daily by the burning of anthracite and bituminous coal.

All of the crude oil of Californian origin which is consumed in San Francisco, Oakland, Berkeley, and the industrial communities along the bay shore, contains certain percentages of sulphur, and a large portion of this sulphur is emitted into the atmosphere daily. Under certain conditions it is true that sulphurous gases put into the atmosphere will do damage, but these conditions do not prevail at or near the Selby works. The large fields of California poppies in bloom at certain seasons along the shores of Carquinez Straits are in no way damaged by the fume which in a dilute condition beats down upon them. The Omaha smelting plant, belonging to the allied interests of the Selby company, has been operated within a mile of the post office in Omaha for the past 25 years, and there has been no complaint. This is as like the Selby plant in its operations as any smelting plant known. No copper ores are handled at the Selby plant. In that connection it should also be recalled that Judge Hunt has found, in the famous Anaconda (Montana) case, that the sulphurous fume emitted from the stacks of the Anaconda company has done no damage to vegetation or live stock. As a result of tests it has become evident that oil products are immeasurably more effective on the olfactories than is sulphurous acid gas. The 'rotten egg', garlic, onion, and similar smells complained of by citizens of Benicia are not from fume produced by the smelter, but are from the vapors and gases emitted from the oil refineries. The Selby company has no desire or intent to damage or inconvenience its neighbors in any manner, and it has taken such steps to ameliorate the old conditions that they are now practically non-existent.

Dredging ground in South Africa has recently been investigated by P. W. Tewksbury, managing director of the South African Gold Dredging Syndicate, who reports that J. C. Watson, formerly Prime Minister of Australia, their representative, has completed negotiations for the option of a large area of country reported to be very rich. The vendors claim that the property is worth several pennyweight per yard, but with the Victorian methods of dredging, a few grains per yard will be considered a handsome proposition. Mr. Watson is now actively engaged in

prospecting and proving the value of the ground, so that he will be in a position shortly to advise the syndicate as to its actual gold value.—*Australian Mining Standard*.

CONSERVATION OF NATURAL RESOURCES.

The report of the National Conservation Commission of 1908 finds an echo in a bulletin (No. 394) just issued by the U. S. Geological Survey, in which are re-printed the papers on mineral resources contributed to the conservation report by members of that Survey.

Coal is considered first, and it is shown that waste in mining loses forever about one-half as much as is marketed. This half is either left in the ground in thin beds or in the shape of pillars to support the roof. Coal has been extensively mined in the United States for not much more than half a century, but the consumption is increasing so enormously that if this increase should continue all the easily accessible coal would be exhausted by the year 2040. It will, of course, not continue at such a rate, for the increasing scarcity will raise prices and check consumption. Water-power, too, will undoubtedly largely take its place. With regard to petroleum the situation is a good deal more serious. Petroleum has been used for less than 50 years, and it is estimated that the supply will last only about 25 or 30 years longer. If production is curtailed and waste stopped it may last till the end of the century. The most important effects of its disappearance will be in the lack of lubricants and in the loss of illuminants. Animal and vegetable oils will not begin to supply its place. This being the case, the reckless exploitation of oilfields and the consumption of oil for fuel should be checked. In natural gas the waste is enormous; 1,000,000,000 cu. ft. are estimated to be wasted into the air every 24 hours. The gas supply will last about 25 years—about as long as it has already been utilized.

Iron is very abundant in nature, but usually is found in ores so poor that it cannot be extracted at any reasonable cost. The best ores are being rapidly worked, and it is estimated that within 30 years they will have been exhausted and that it will be necessary to resort to ores that cannot now be worked at a profit. This, of course, means higher prices unless new and much cheaper processes shall have been invented. Gold, silver, and zinc are all so abundant that the supply is likely to last for centuries. Copper is also abundant, but is largely in low-grade ores which cannot now be profitably worked. At increased prices, however, the supply will probably be abundant. For lead, however, the outlook is much less favorable. Its production in the United States is still increasing slightly, but is decreasing elsewhere in the world, and this despite a marked increase in prices. Probably the world's output has already reached a maximum and will henceforth decline. The phosphates, it is estimated, will be exhausted in about 25 years, and the farmer will then have to look elsewhere for fertilizers.

Fresh supplies of all materials may, of course, be found, but (except for gold) it seems unlikely that they will be great enough or valuable enough to materially affect the estimates.

A RUSSIAN MONEY TRUST.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE E. WALSH.

Without exactly understanding the American meaning of a 'trust', a small coterie of mine owners, backed by the Russian Government, has enjoyed for years one of the closest monopolies of the world, and although the United States Government, through its Geological Survey, has been working overtime to break up this foreign 'trust', very little actual headway has been made. The singular workings of this trust may easily be accepted as an example of the uncertainties of any attempt to corner the market on an article needed the world over, and the peculiar desperate attempt made to relieve the strain at a time when the article became a drug on the market finally resulted in what might be called a money-trust.

Until quite recently the Russian Urals supplied 95% of the world's platinum. For upward of a century the production of this metal in other countries was almost a negligible factor. Half a dozen mine owners control the platinum-producing districts of the Urals around the mining settlement of Miac, but the Russian Government keeps a close watch on the mine owners, and knows to the very ounce how much of the precious metal is taken out. Many times in the past Russia has used this absolute monopoly to pay her debts, and after the close of her war with Japan she increased the price of platinum to help her recuperate.

But the story of the platinum trust in Russia dates back to an early period. Early in the present century the control of the platinum output was so rigorously enforced by Russia that the price was forced too high for the demand, and it became a drug on the market. The price dropped, and still the supply was ahead of the demand. Finally in desperation the Government sought to relieve the strain by adopting a course which the free-silver advocates worked so hard to accomplish in this country, namely, to advance the price to accommodate the mine owners. Platinum was adopted as a metal for money, and from 1828 to 1845 the three, six, and twelve-rouble coins of Russian money were made of platinum. The St. Petersburg national mint issued many millions of dollars' worth of money of fine platinum. This government edict saved the platinum trust from bankruptcy, and the mine owners as well as the Government profited for a season by the move. But platinum proved an uncertain and unwieldy metal for money purposes, and in time the Government had to drop it. Platinum is so hard that it is difficult to work, and the Government found, to its cost, that it could not mint and then re-melt and coin it again except at an enormous expense. The following is the official reason given for dropping platinum and returning to gold as a standard money metal:

"The essential quality of a monetary metal is its power to pass almost without expense from the form of the ingot to that of money, and vice versa. An ingot of gold duly refined can be moneyed, and the money thus obtained be re-cast in ingot, without the total expense of this double operation (coining and

re-melting) exceeding one-half per cent of the value of the fine metal."

But platinum, owing to the difficulty of re-melting and coining, cost as much or more than the original metal mined, and the Government found that its method of relieving the miners worked around in a circle. It was providing the metal a market, but it could not re-use it again for coinage except at a loss when it was worn down to a point where it was below weight or the figures on it were undecipherable. The coinage was then changed to gold again, and the platinum money recalled and exchanged.

Then one of the curious phases of Russia's national life was revealed. It was found impossible to bring out from its hoarding place the platinum money. The official publications announced the change in the metal for money, but not much more than half of the old platinum money was ever offered for redemption. The Russian mujiks living in the remote villages are great hoarders of money, and distrustful of everybody and everything. They either never heard of the change in the coinage, or, taking it as a ruse of the Government to get hold of their wealth, they refused to part with their platinum. Meanwhile, the demand for platinum in the arts and sciences increased rapidly, and its price advanced accordingly. It reached a par with gold and then passed it. When its value surpassed that of gold some energetic efforts were made to get hold of the old hoarded platinum money, but even when the metal was at twice the value of gold, very little came from its hiding place. Some enterprising speculators sought to entice the platinum from the mujiks by going from one remote village to another, offering a good premium for the old coins. But official corruption and robbery had made the mujiks suspicious, and they calmly declared they had no platinum money. The speculators tried every art and device, and finally had to abandon their quest.

It is more than half a century now since the platinum money was officially withdrawn from circulation, but over half a million dollars' worth of the coins is hidden away, and only occasionally small quantities leak out and find their way to the Government mint. Naturally the finder of this platinum money takes it readily in exchange for gold, and then reaps a big premium in selling it in the open market. Russia's monopoly of platinum has held without serious drawbacks for upward of a century, although the United States has made strong efforts to break the trust. The experts of the Geological Survey have been steadily hunting the different parts of this country for platinum deposits, and with some fair success in recent years. Platinum was found in the Republic of Colombia as far back as 1735, but it was considered worthless and thrown back into the tailing piles. Since then small quantities of it have been discovered in South and North America. The experts have expected to find deposits of the metal in Alaska, but no great discovery has yet rewarded them. Gold and platinum occur together in the Ural mountains, and there is apparently no reason why the 'white gold' should not be discovered in mines in this country. Thirty or forty years ago platinum was worth about two dollars an ounce, but today it

ranks alongside of gold. Nearly every country of the world has had experts hunting platinum deposits, and claims have been made frequently that it had been found; but it was in such small quantities that it has not seriously affected the price.

Only two metals have a higher specific gravity than platinum—osmium and iridium. Until the electric furnace was invented osmium had never been melted. Even the melting point of platinum is 1779°, and that of iridium a little higher. The famous metric bar preserved at Paris, which serves as an international measure, is made of platinum with 10% iridium.

Platinum has been mined ever since the ancient Egyptians used it for various purposes, but all of that metal ever discovered and mined from that early date up to the present would hardly exceed 100 tons. The largest nugget found weighed about 20 lb. The total annual product of the platinum deposits of the Ural mountains does not exceed in value \$2,000,000.

For these and similar reasons Russia's exclusive monopoly has a pretty firm grip, and there is no way to break it without a new discovery of an unusual supply. The gold miner hunting for his elusive precious yellow metal might well keep a sharp lookout for the 'white gold'. A single deposit, one-tenth the size of many gold mines, would enrich one enormously and prove of world-wide importance.

Coal is found at many points in Alaska, but detailed estimates of coal reserves cannot as yet be made. Even where a coal field has been both developed and surveyed in detail, there is a very large amount of uncertainty in all tonnage estimates. Moreover, according to the U. S. Geological Survey, the Bering and Matanuska fields, which contain the most valuable coals of the Territory, are regions of great structural complexity, which introduces another factor of error. In Alaska only between 300 and 400 square miles of coal-bearing rocks have been surveyed in detail, and the data in regard to the remaining 800 square miles believed to be underlaid by coal are very meagre. It is estimated that the unsurveyed coal fields cover 12,000 square miles, but of these fields only the general outline is known, and they must be surveyed to ascertain how much of the area is underlaid by workable coal-beds. It should be remembered, also, that more than a third of Alaska is almost unexplored. The facts clearly show that the present low status of coal mining in Alaska is no criterion of the future importance of this industry. Up to the present time coal has been mined only for local markets, and the high-grade fuels of the Bering river and Matanuska fields are practically untouched. These two fields can ship coal only when railway connection with tide-water has been established. Some progress was made on such railways during 1908, but it will probably be two years before any considerable shipments are made. In both these fields the activities in 1908 were largely confined to surveys for patents, assessment work, and trail and road building. Up to the close of 1908 no patents for coal lands had been issued, and this tended to discourage development.

MINERAL PRODUCTION OF VIRGINIA IN 1908.

Written for the MINING AND SCIENTIFIC PRESS
By T. L. WATSON.

The statistics of production and value of the mineral resources of Virginia for 1908, collected by the Virginia Geological Survey in co-operation with the Division of Mineral Resources of the U. S. Geological Survey, are given below in tabular form. The figures are well below the totals of most of the materials recorded for 1907, and clearly indicate the effect of the recent business depression arising from the monetary troubles. The setback will undoubtedly prove, however, only temporary, as already there has been a considerable revival in mining interests throughout the State. The decrease in production and value of the mineral resources in 1908 over that of 1907 is especially noticeable in the larger industries, such as coal and coke, clay products, iron ores, stone, talc, and soapstone. Some of the smaller ones, indeed, show a marked increase. The total value for the year 1908, exclusive of gold and silver, lead, zinc, and copper, is \$12,049,717, or about 70% of the production for 1907.

PRODUCTION AND VALUE OF MINERAL RESOURCES
IN VIRGINIA IN 1908.

| | Quantity. | Value. |
|--|------------|--------------|
| Coal, short tons | 4,259,042 | \$3,868,524 |
| Coke, short tons | 1,162,051 | 2,121,980 |
| Clay (brick and tile), thousands..... | 205,235 | 1,499,130 |
| Iron ores, long tons | 692,223 | 1,465,691 |
| Lime and cement, barrels..... | 1,629,178 | 775,660 |
| Talc and soapstone, short tons..... | 19,616 | 458,252 |
| Pyrite, long tons | 116,340 | 435,522 |
| Granite | | 321,530 |
| Limestone | | 280,542 |
| Mineral water, gallons | 2,009,614* | 207,115 |
| Slate, squares | 41,678 | 194,356 |
| Sand and gravel | | 119,095 |
| Manganese and manganiferous iron ore, long tons | 6,418 | 63,324 |
| Pottery | | 37,777 |
| Sand-lime brick, thousands | 6,181 | 36,934 |
| Millstones and sandstone | | 10,554 |
| Mica, short tons..... | 442 | 7,346 |
| Sheet, pounds | 13,427 | |
| Scrap, tons | 46 | |
| Clay mined and sold..... | | 3,250 |
| Miscellaneous (mineral paint, barytes, gypsum, feldspar, salt), short tons | 25,499† | 143,135 |
| Total value | | \$12,049,717 |

*Exclusive of 119,672 gal. used for soft drinks.
†Exclusive of salt.

In addition to the above, Virginia produced in 1908, 25,087 lb. of copper, as against 57,008 lb. in 1907; 910 short tons of spelter; and 13 of lead as against 82 in 1907. The returns for gold and silver production in Virginia for 1908 are not yet completed, but they will probably be less than for the preceding year (1907), in which year they amounted to only \$8400 in value, \$100 of which was credited to silver. There was no production of arsenic, asbestos, fluorspar, graphite, quartz, nickel, phosphate, and rutile in Virginia in 1908, although preparations are being made for the resumption of mining of a majority of these in 1909. A product of which Virginia has a practical monopoly in this country is rutile. It occurs in Nelson county in extensive deposits of superior quality, in two distinct types.

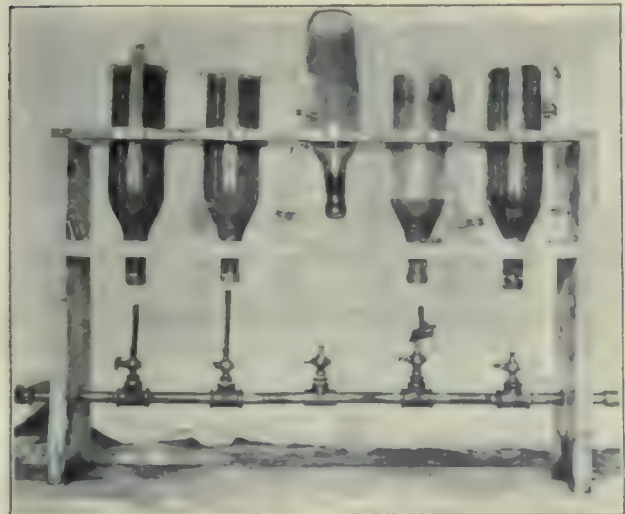
BROWN TYPE OF LABORATORY AGITATOR.

Written for the MINING AND SCIENTIFIC PRESS
By T. S. LAWLOR.

The need of an efficient scheme of air-agitation in laboratory tests to parallel working conditions in cyanide treatment where agitators of the Brown or Pachuea type are to be used, led to the adoption of the apparatus described below. The photograph shows a battery of five agitators that was used for a number of tests, with satisfactory results.

Agitators No. 1 and 2 were working at the time the photograph was taken. No. 3 is empty and shows the method of introducing the air-pipe through the inverted cone of rubber cork in the neck of the bottle, forming the bottom of the agitator. No. 4 shows a settled charge of 25% solids (200 gm. of ore and 600 c.c. of solution). No. 5 is being used as a percolator, the heavy sand forming a filtering medium.

In the section the position of the cork, the central column, and the air-inlet are shown in the positions found best suited for continuous agitation. A is an ordinary brandy bottle, chosen on account of the



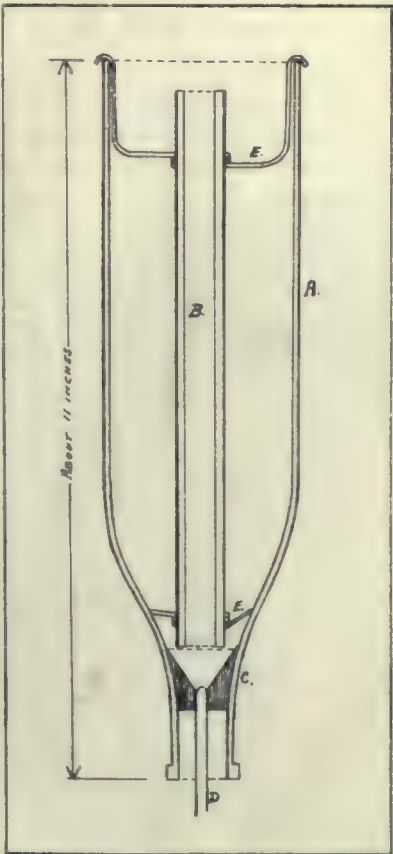
Battery of 'Brown' Agitators.

slope at the neck and of its capacity. B is a 3/4-in. gauge glass tube, 8 in. long, the centre of which is directly over the air-inlet. This size of tubing measures about 7/16 in., inside diameter, and is accordingly rather out of proportion, but was preferred on account of the tendency of the bubbles of air to get outside a smaller column when re-starting agitation after settlement. C is a No. 3 rubber cork, first bored for 1/4-in. glass tubing, then cut from the extreme upper edge toward the centre to form a conical bottom below the central column. This cork should be firmly set into the neck. D is 1/4-in. glass tubing, with the end closed to about 1/64 in. by heating without drawing out. The closed end is so inserted that it just enters the bottom of the cone. EE are iron wire supports, bent as shown, to hold the column firmly.

The height of the central column above the air-inlet can be determined by test, using the smallest possible amount of air to agitate, and care should be taken to have the centre of this central column directly above the air-inlet, and also to have it centrally

disposed in the bottle. Glass tubing is more suitable for the central column than iron pipe, on account of having a smoother surface, which provides for being more easily cleared of packed sand or slime if for any reason agitation be stopped.

A mere puff of air is required to maintain agitation in these bottles, but by using well ground pet-cocks the battery shown was operated continuously with air taken direct from a receiver registering 100 lb. pressure, no reducing valve being necessary. Where compressed air is not to be had, a portable blacksmith forge or electric fan can be arranged to run continuously, and give all the air necessary. In



'Brown' Type Air Agitator. Section Through Centre.

starting a test with pulp containing 25% solid, 600 c.c. of solution is placed in the bottle and the pet-cock opened just enough to start circulation; 200 gm. of the ore is added slowly, so as not to stop agitation; when charged, the upward flow in the column is reduced to the minimum by shutting off the air until the solids at cone are just kept from packing. After agitation is finished, the clear KCy solution is withdrawn, and wash water added to bring the pulp to the original level. Lift the column and clear it from packed solids by moving gently up and down in the solution. While holding the column a little above the regular position, turn on light air-pressure and gradually lower until agitation starts again.

A series of KCy tests were run on slime all of which passed 200 mesh, as well as on an ore containing 5% of heavy sulphides and giving the following screen analysis:

| | % |
|------------------------------|------|
| Between 40 and 80-mesh | 26.7 |
| On 150-mesh | 22.3 |
| Passed 150-mesh | 51.0 |

Perfect agitation was obtained with pulp containing 25% solids.

The agitator will work equally well on slime, sand and slime, heavy sand, or concentrate, and even concentrate in a pulp containing 40% solid matter can be agitated if desired.

After washing, the tailing can be readily removed without addition of excess of water for rinsing. The charge is allowed to settle, and the supernatant liquor is siphoned off until within $\frac{3}{4}$ in. of the top of the settled solids. The bottle is then taken from stand, the air-inlet pipe is withdrawn from below, leaving the hole in the cork, through which, with a little shaking and whirling of the pulp, the entire charge may be run out upon a filter. When the ore contains a sufficiently high percentage of coarse material, as in the screen analysis given above, the bottle with the column removed may be used as a percolator. The sand forms a filter above the small opening in the air-inlet, and a few taps upon this will be found sufficient to start the percolation of clear solution after perhaps a little of the finer material has filtered through, which may be released on top.

MINERAL DEPOSITS OF TREBIZOND.

The district of Trebizond, which embraces the northeast quarter of Asia Minor, has been only superficially explored, although there are many places where the Greeks and Romans extracted ore. Their methods were primitive. They left around their diggings quantities of ore which with modern methods of extraction would be considered worth working. Copper, iron, manganese, gold, silver, mercury, zinc, antimony, arsenic, coal, and petroleum are known to exist. Under favorable governmental conditions this country will offer great inducements for mining enterprises. A new mining law, modeled after the German law, has recently been presented before Parliament. This is said to give greater security to the holders of concessions, and it is believed that it will tend to develop mining and attract foreign capital. The geographical position of Trebizond and of its mineral deposits, near the Black Sea coast, is favorable. Labor is abundant, wages ranging from 25 to 50 cents per day. One of the chief drawbacks is the lack of good roads and the entire absence of railroads, but this is one of the first things to which the new Government promises to give effective attention. In connection with the projected railroads, the coal deposits will have special interest and value. It is reported that at Erzeroum a company has recently been formed to develop the petroleum of Mamahatoun. Petroleum is also supposed to exist in the region of Van and on the Black Sea coast near Surmene. The Province of Trebizond is believed to be particularly rich in minerals. The indications are that there is much copper in this Province, as well as silver-lead, antimony, zinc, manganese, and coal. The adjoining Province has extensive and valuable coalfields in the Heraclea region. Few concessions have been granted for mines, but a considerable number of research permits have been obtained, and others are on the way. Most of the holders of permits expect to sell them. Unfortunately they generally put a high value on the claims.

HAINES DISTRICT, ALASKA.

Written for the MINING AND SCIENTIFIC PRESS
By W. A. SCOTT.

Haines is on the west side of Lynn Canal, 17 miles south from Skagway. It was first started as a mission for the Chilkat Indians, and eight years ago Fort William H. Seward was established there. In 1898 Haines was the starting point for those who went to Five Fingers and Selkirk over the Dalton trail. This trail went up Chilkat river 24 miles, thence westerly up the Klahini 30 miles, crossing the divide near the head-waters of the latter, to the drainage of the Alsek river. It was during the rush of 1898 and 1899 that the placer discoveries were made on Porcupine creek, a tributary of the Klahini, 38 miles from Haines; and at the same time a man named Hopkins camped for a time on the head-waters of the Klahini and named it Rainy Hollow, where important locations of copper leads were afterward made. Within the last two years the Alaska Road Commission, under direction of the War Department of the United States, has built a fairly good wagon road from Haines to Porcupine, and thence a few miles farther west to the international boundary; and the road commission of British Columbia is expected to extend this from the boundary to Rainy Hollow, a distance of about 18 miles, making a continuous road 56 miles westwardly from Haines. The Chilkat is a good sized, swift flowing stream, with a channel which widens to a mile where the river empties into Lynn Canal. The Klahini is much the same in character, draining a country of glaciers, jagged ranges, and sharp peaks, presenting a scene that is typically Alaskan. Going up the Klahini takes one in a westerly course as far as the mouth of Porcupine creek and on to the boundary line; from there it goes northerly to its source in the Rainy Hollow district. Before the international boundary was definitely established, the provisional boundary passed along the Klahini, where the former official stakes still remain. On the road to Porcupine the traveler passes through the Indian village of Klukwan, consisting of a Government school for Indians and a few frame houses. By the roadside are two brass cannon, which are said to have come into possession of the Chilkats years ago, but under what circumstances the cautious, secretive natives refuse to divulge.

The most important mining operations of this district are on Porcupine and McKinley creeks, the latter an affluent of the Porcupine. The Porcupine Gold Mining Co. has placer claims covering two miles of that creek. The original locations here were tested and worked to some extent by Harvey Wiley, Mix Brothers, and Fenley, who afterward sold to Jack Dalton. In May 1907 the Porcupine Gold M. Co. purchased the Dalton interests and acquired four additional claims. The creek, in its lower course, is bounded by limestone walls, and in its upper course cuts through slate. At the narrowest place the alluvial deposit is 75 ft. wide; in other places 300 to 1200 ft. The depth, from the surface to bedrock, is from 14 to 42 ft. The material grades from fine sand to coarse gravel and heavy boulders. The gold recovered is unusually coarse, occurring in rounded parti-

cles and small nuggets. Last year the company built a flume 5480 ft. long; at the intake it is 40 ft. wide by 8 ft. high. Below the centre it is 26 ft. wide by 6 ft. high, and 24 ft. wide at the spillway. It has an average grade of 1.65%. In the construction of the flume 2-in. spruce planks were used for the bottom and sides, the heavier material being hemlock. The stream carries from 23,000 to 54,000 miners' inches of water, the entire volume of which is turned into the flume. At the head of the flume is a 70-ft. dam, the crest of which is 4 ft. higher than the bed of the creek. Just below the dam are six gates for regulating the flow of the water. The main flume is tapped in three places, serving hydraulic operations at each. At the upper one is a penstock, diverting the water to a sluiceway; at this point is pit No. 1, excavated to bedrock, the gravel being lifted in scoop-shaped buckets to the hopper that sets over the sluiceway, a steam-hoist and derrick being used in this work. The boulders are lifted separately and piled on worked-out ground. The water is pumped from a bedrock sump by a steam-pump. At the next penstock below the requisite volume of water is diverted to a second sluiceway; a Pelton wheel is brought into use at this penstock, a shaft from which operates a hoist that lifts the placer-dirt from pit No. 2, dropping it into the sluiceway. This pit reaches bedrock at a depth of 42 ft. An 8-in. tandem centrifugal pump keeps it clear of water. Beginning 1000 ft. below pit No. 2, a bedrock sluice is being put in, which will extend upstream 2000 ft., and is being built 6 ft. wide by 4 ft. high. This will bring hydraulic giants into use on a considerable scale. At pit No. 2 a Lidgerwood overhead trolley-lift will be installed to supplant the derrick in handling the placer dirt. As soon as the bedrock flume is further advanced the entire plant can handle 1500 cu. yd. per day. As to values, it is claimed that tests and operations by Dalton and others showed a recovery as high as \$6.50 per cubic yard, and that clean-ups this spring showed an even higher content. But E. E. Harvey, general manager of the property, estimates an average value of \$3 per yard. Thus far the entire plant, including the flume, sluices, dam, hydraulic and steam-lifts, pipe-lines and giants, cost \$200,000, the main flume costing \$106,000. Operations began this year in May, and the length of the season is six months. At the source of Porcupine creek is a glacier, on the opposite side from Muir glacier. The period of high water is July and August. At present there are 80 men on the pay-roll, working two 10-hour shifts.

The Cahoon Creek Mining Co., under the management of Thos. Vogel, is conducting placer operations on McKinley creek, a stream that flows into the Porcupine two miles above the property of the Porcupine company. They are operating with a hydraulic lift on an alluvial deposit 60 ft. wide and about 40 ft. deep. This section of placer material is situated below an 80-ft. waterfall in the stream; the water for giants and sluicing is brought from Cahoon creek,

above the falls, by means of a 1½-mile ditch, a ¾-mile flume, and 2000 ft. of 12-in. pipe. This company has rich ground, employs 30 men, and makes regular clean-ups of placer gold.

Rainy Hollow district is about 4 by 6 miles in extent, situated at the timber line, at an altitude of 3000 ft., extending up to the summit that divides the Klahini from the Alsek drainage. The district is described as having limestone and schist country rock, with copper ore on the contact between the two. There are also numerous dikes of granite. The New York and Custer veins are said to be from 5 to 60 ft. wide, containing a good grade chalcopirite, with some bornite. Tests are said to show considerable gold and silver. The first locations were made by J. H. Chisel and M. J. O'Connor, of Haines,



Porcupine Gold Mining Co. Flume.

in 1898-9. The former sold his holdings last year to Walter S. Brown for \$25,000. The purchaser and associates expect to start development this season. He has four claims, each 1500 ft. square. There are 85 claims located in the district; among the other parties having interests there are Tim Creedon, S. J. Weitzmann, J. W. Burnham, Dan Sullivan, Mike Hasson, R. Kennedy, and Martin Conway.

Hornsilver, Nevada, 26 miles south-southwest of Goldfield, stands at an altitude of 5900 ft. above sea-level, on a gentle slope that opens northward into a broad desert valley and is enclosed on other sides by hills. The principal mineral deposits lie southwest of the town, within a distance of a mile, and are developed mainly by a single mine, from which shipments of ore aggregating in value about \$40,000 were made in 1908. The valuable contents of the veins are native gold and chloride of silver. The district has been described recently by F. L. Ransome of the U. S. Geological Survey.

THE TYUTICHA ZINC MINE.

Written for the MINING AND SCIENTIFIC PRESS
By CHESTER W. PURINGTON.

The Tyuticha zinc mine is situated in Siberia, 200 miles in a straight line northwest of Vladivostok, 24 miles from the mouth of the Tyuticha river. This river falls into a small harbor, about 30 miles north of Olga bay, situated in the portion of the North Pacific known as the Sea of Japan. Small steamers, making about 10 knots an hour, ply up the coast from Vladivostok, and afford communication with the mouth of the river in about 24 hours. The property consists of five full claims, equivalent to about 1200 acres. It belongs to Jules Brünner, of Vladivostok, who is of Swiss birth, but has acquired Russian citizenship. The claims were located in 1902, and patents obtained to them in 1903. The discovery is said to have been made by Chinese, who told Mr. Brünner about it in repayment for some kindness.

In 1902 the owner endeavored to interest London capital, and in 1903 the firm of Aron Hirsch & Sohn sent a German mining engineer to examine the property. This engineer determined that the ore was not in the main a silver-lead ore, as had been supposed, but that the deposit consisted of zinc silicate or calamine. It was further determined that the ore does not lie in a vein or bed, but is a massif or stockwerk, the size of which it was impossible to determine without extensive development. A considerable quantity of samples was sent to Germany. These, on being assayed, gave satisfactory results. Subsequent more elaborate sampling of the orebody, where it has been opened by development, has fully substantiated the first results. The average tenor of the ore, taking the mass as a whole, is 48% zinc.

As a result of the interruption due to the Russo-Japanese war, no serious work was done on the property until 1906. The thorough opening of the orebody has now established the fact that 200,000 tons of zinc ore of the character and value described, are present in a single mass. The calamine as taken out resembles chalcedony in appearance, and might easily be mistaken for it, except that it is softer. It is pearl-gray in color, translucent, and botryoidal in structure, frequently with concentric laminations. In the vicinity of the zinc mine, veins have recently been uncovered, some carrying argentiferous galena, others massive copper pyrite. The country rock of the vicinity is igneous for the most part. Granite, metamorphic greenstone, and Paleozoic schists are present.

On the basis of hauling with wagons to the seacoast the total cost of the ore delivered f. o. b. Antwerp is \$15 per long ton. The market price of the ore in Antwerp, reckoning on the lowest basis, is \$30. The present cost of wagon-haul is from \$6 to \$6.50 per ton, which cost it is planned to reduce to about \$1 per ton by means of a narrow-gauge railway and rope tramway, now under construction. Thus the entire cost of mining, hauling to port, and transporting to Antwerp will approach \$10 per ton. In mining, Che-Fu Chinese are employed at an average price of 60c. gold per man not 'found'. Owing to an understanding between the Nobel company and the

American powder trust, California powder companies will not sell the better grades of dynamite for delivery at Vladivostok. The price of dynamite at Vladivostok is 67c. gold per pound. Timber is available in inexhaustible quantity, as the region is heavily wooded with spruce, pine, oak, birch, and walnut. The orebody is, however, exposed on many sides, so that mining is practically all open-cut work.

The mine lies at an elevation of 1500 ft. above the sea, on the crest of the Sikota-Alin range. The upper station of the railway will be at an elevation of 700 ft. It is planned to connect the mine by wire-rope tramway $1\frac{1}{4}$ miles in length with that point. The narrow-gauge railway, with 20-lb. rails, will be equipped with two locomotives. It is being constructed by A. Koppel & Co., and will have a transporting capacity of from 80 to 100 tons daily, which capacity it is planned later to increase. There are now said to be 16,000 tons of ore ready on the dumps for transport by railway as soon as completed. The railway will be ready in August. Steamer transportation to Olga bay and vicinity is available throughout the year, and deep-draught steamers can enter. The zinc deposit is the first mineral discovery of any importance in the region, it being almost entirely unexplored. As foreigners are forbidden, except under onerous conditions, to hold or operate mines within 65 miles of the Pacific Coast of Siberia, it is not likely that development will be rapid, notwithstanding the great mineral possibilities of this region.*

The manganese industry of Brazil is at present in a depressed condition, according to consular reports. The exports of manganese ore in 1908 were valued at \$1,200,868, against \$2,442,984 in 1907. The exports of ore to the United States in 1908 amounted to only \$140,648, as compared with \$521,581 in 1907. According to Brazilian newspaper reports, the high freight rates on ore shipped by rail to the seaboard are the cause of the depression, but as a matter of fact the high cost of production shares equally with the freight in causing it. When the exchange value of the milreis is low, manganese ore can be profitably mined, but when the exchange value rises to 15d. (30c.), as at present, mining becomes unprofitable. Manganese ore is sold abroad at gold prices, while it is produced on a paper-currency basis. When an American dollar received for the ore was worth 4 milreis, the gold cost of the ore was about 25% less than when the dollar was worth only 3 milreis, the paper cost remaining the same. When exchange became more or less fixed at 15d. to the milreis, the exchange value became too high for profitable mining. Outside of the cost of handling the ore from the mines to the railway, on the railway to the seaboard, State taxes, etc., all of which are capable of the necessary modifications, there is no special reason why manganese ore should cost more in Brazil than in Russia. The present exports to the United States are running about the same as in 1908, and the outlook for a revival in the industry is not very promising.

*The data for the above were for the most part furnished by Mr. Kulm, the manager for Arthur Koppel Co. in Vladivostok, to whom my thanks are due.—C. W. P.

NOSTRUMS.

Written for the MINING AND SCIENTIFIC PRESS

By F. H. MASON.

What mining engineer has not, at some time in his career, run against nostrums in one form or another? Generally his mill-man is the worst transgressor; then come the blacksmith, and the engine-driver; even the cyanide-man and the assayer, especially if they are rule-of-thumb men, are often addicted to the fault. Those of us who were initiated into the mysteries of mining in Cornwall well know the care with which each assayer guards his own particular secrets that assure the success of his dry copper assays and, incidentally, often make his results differ from those of his fellows.

A poor mill-man finds it infinitely easier to remove the greenish gray hydrated oxide of copper, that sometimes forms on the surface of his plates, by the aid of a 'solution' than it is to prevent it from forming by carefully building up a thin layer of gold amalgam over the plate, and, in many places, each mill-man has his own particular 'solution', the composition of which he shrouds with an air of mystery. It is needless to say that when this hydrated oxide of copper (with which is sometimes found a little basic carbonate or sulphate) is being formed, its removal by suitable (or unsuitable) solvents, instead of its prevention by the proper amalgamation of the plates, will ultimately result in pitting and ruination of the copper. Often the superintendent is to blame from demanding that the plates shall be cleaned too 'tightly'.

When machine-drills are used for stoping some grease is, occasionally, sure to find its way to the mill, and then the mill-man runs for the lye-pot. The fact that mineral oil is generally used as a lubricant for machine drills, and that it is not saponified by caustic alkalies, has no influence on the average mill-man's desire to apply lye liberally the moment he detects the slightest sign of grease on his plates. Nor is the mill-man always content to allow the ravages of his ignorant fetishes to confine themselves to the plates. On one occasion I was visiting a mine manager, who had recently erected a new 20-stamp mill, and he complained bitterly that the cams and tappets were wearing abominably. He took me to see the mill, and I acknowledge that, for a mill that had been running less than two months, it was the sorriest spectacle I ever beheld. The cams and tappets were made of chrome steel, so that I knew that the fault was not with the metal, but adhering to them was a nasty black, sticky, gritty substance. After a great deal of trouble I obtained from the mill-man the recipe for his 'lubricant', the particular advantage of which, he assured me, was that if a little happened to fall into the battery it would not retard amalgamation. I have forgotten the exact proportions, but the ingredients were molasses, butter of antimony, and graphite, and, worse still, the graphite took the form of old plumbago pots ground up, which, it need hardly be added, contain a far larger proportion of abrasive than of lubricant.

The blacksmith's art has, from the earliest ages, been surrounded with mysterious recipes for quench-

ing fluids with which to harden steel. Pliny claimed that waters of certain rivers contained virtues not possessed by those of other rivers, and, if we follow the subject, we find such quaint recipes as, "Quench the red-hot steel in the blood of a young man 30 years of age, and of a sanguine complexion, being of a merry nature and pleasant." Robert Austen, in his 'Introduction to the Study of Metallurgy', regrets that so many recipes for tempering steel have been lost. The writer is inclined to disagree with his late revered professor and regret that so many remain. But, it may be argued, if these recipes have been handed down from time immemorial there must be something in them; and we reply, certainly there is something in them, but it can be reached by a quicker and less objectionable route. The gist of the whole thing lies in the conductivity for heat of the quenching fluid; the greater the conductivity the quicker will the steel be cooled and the less opportunity will there be for a re-arrangement of the molecules.

Take another instance; the engine-driver or stoker who 'doctors' his feed-water. He is the most dangerous of all, for he is not only endangering machinery, but life and limb. Among favorite remedies for the removal of scale we find oak-bark, oak and mahogany saw-dust, potato peelings, mineral oil, tallow, ammonium chloride, sodium carbonate, and molasses. The last is a panacea for all ills, including human ones, especially in the Maritime Provinces of Canada. Though some of these substances may, in a few instances, produce the desired effect, their addition to feed-waters is fraught with considerable and unnecessary danger. Then, too, these substances are usually added without any consideration of proper proportion to the amount of water that is being evaporated. The place to treat a feed-water is before it enters the boiler, and it should be only treated there after a knowledge of the composition of the water has been obtained. 'Monkeying' with feed-waters in the boiler—or outside of it—without a knowledge of the contained solids will sooner or later lead to disaster. The use of nostrums is the result of ignorance. Unfortunately there is a quantity of cheap literature, generally possessing some such title as 'Every Man His Own Mining Engineer', which, although it may contain some valuable information, also contains many recipes included with a view to filling the book. The rule-of-thumb mine superintendent, who has not the education to enable him to sift the good from the bad, devours all the recipes with avidity, and applies them, haphazard, to fit difficulties as they turn up. Unfortunately many of these nostrums appear to fulfill the functions with which they are credited, while at the same time they are insidiously doing work of destruction in another direction which may not become evident until the damage is irreparable. The underlings of such a superintendent frequently leave his service before they have seen the bad effects of the nostrums, and carry it to another camp.

Gold-bearing gravels in the Grant's Pass district of Oregon vary in thickness from a few to 50 ft., and their gold content also varies from 20 to 40c. per cubic yard.

GUATEMALAN MINING CODE.

*In view of the increased interest in mining possibilities in Guatemala, facilitated by the extension of the railway from Mexico into that Republic, the following extracts from the mining code will be of interest. The Law was issued as Decree No. 686, by President Manuel Estrada Cabrera, on June 30, 1908:

Article 1. The mineral substances and fossils occurring on the surface of the ground, or hidden under the soil, are, in respect to the regulations governing their exploitation, classified under three heads; namely, mines, clearings, and quarries.

Art. 2. Such places are to be considered mines where veins, beds, or pockets are met with containing gold, silver, platinum, quicksilver, lead, iron in veins or beds, tin, manganese, copper, zinc, bismuth, cobalt, arsenic, magnesia, antimony, molybdenum, or any other metallic substances, sulphur, coal, lignite, bitumen, alum, and sulphates with metallic base.

Art. 3. Clearings or loose soil containing minerals comprise alluvial soils containing iron, or pyrites capable of being converted into sulphates of iron; earth containing alum and peat.

Art. 4. Quarries comprise slate, building stone, marble, granite, limestone, gypsum, pozzuolana, basalts, lavas, chalk, marl, sand, flints, argill, kaolin, potters earth, all kinds of earthy substances, pyritic earths that are esteemed useful as fertilizers, whether worked by open-cuts or by means of underground excavations.

Art. 5. Mines specified in Art. 2 belong exclusively to the State.

Art. 6. Private individuals, by following the prescriptions set forth in this Code, may obtain the possession and ownership of mines, whatever be the origin and nature of the lode, and whether found on national, municipal, or private property.

Art. 7. Anyone who has acquired a mine is obliged to exploit and utilize it in accordance with the legal prescriptions.

Art. 10. Gold-bearing sands, alluvial and shifting deposits of iron, and other mineral products of rivers and placers open to the public, may be freely utilized by anyone, without need of a permit. If anyone should wish to treat such sands and substances in a permanent establishment, by means of machinery, or constructing works and buildings for the purpose, he may solicit the concession of a mining claim. For the demarkation and concession of the mining claim referred to in this Article, it is an indispensable condition that the party soliciting it prove that he has obtained the consent of the owner of the land on which he wishes to constitute the claim; or the fact of having paid the amount of the indemnity for the damage and injury that may be, or already have been caused to said proprietor. When the parties cannot come to an agreement, the indemnity shall be determined by the respective courts of justice.

Art. 17. In order to prospect or explore on cultivated or enclosed lands, it is indispensable to procure a permit from the owner or manager of the property. In case of a refusal on their part, the Alcalde of the place (local police authority) may on his authority grant the permit solicited, after giving audience to the parties interested, and experts, should he consider this necessary, or either party should demand it.

Art. 24. After a mine is formally registered, the land on which it is situated is subject to its (the mine's) right to occupy as much of the superficial area as may be necessary for its convenient exploitation, and in the measure that the development of the works may require.

Art. 35. A mining claim (or right) consists of a block of indefinite vertical depth, starting from the commencement of the subsoil, with a superficial area of 10 hectares, of rectangular form, and having on one side at least a length of 100 metres.

Art. 36. The discoverer of a new vein, pocket, or lode of any other description, containing any of the substances or precious stones enumerated in Art. 2, whether native or foreigner, is entitled to a concession.

Art. 39. The discoverer of mines on lands where no other has been conceded and registered, within a radius of 5 kilometres, is entitled to a concession of from one to three claims.

Art. 40. The discoverer, within a radius of five kilometres of a registered mine, is only entitled to one claim.

Art. 41. Excepting in these cases, in no other way can more than one claim be granted to the party who solicits it, but other concessions, without limit as to number, may be acquired by transfer of titles of ownership.

Art. 46. Every application for the denouncement or concession of a mine must be presented in the office of the Jefe Político of the Department where it is situated.

Art. 47. The application spoken of in the preceding article must express in the written petition: (1) The name of the petitioner and of his associates, if he has any, with place of residence and occupation. (2) The most prominent and distinguishing marks of the place where the lode for which he solicits the concession is situated. (3) Whether the mountain or land where the discovery is made has been exploited or not. (4) The nature or kind of substance discovered, accompanying a sample thereof to make it fully known. (5) The number of claims which the petitioner wishes to acquire, and if the land can admit them. (6) If the land is of national, municipal, or private ownership, stating in the last case the name and residence of owner. (7) The nature of the vein or lode discovered, the form of its lay (stratum), and the direction, more or less, that it crops out on the surface. (8) The name he proposes to give to the mine, and the names of neighboring ones, if there are any. (9) The place, date, month, and year of his application.

Art. 49. As soon as the record is made, the petition shall be despatched, the interested party being notified that within a term which must not exceed 15 days in case he has not presented together with the denouncement the necessary evidence, he shall furnish proof: (1) Of the existence of the lode in the place denounced, and that the sample presented was extracted therefrom, proving this by the testimony of two witnesses. (2) That he has erected visible landmarks or signs on the surface to distinguish the lode he has petitioned for, from any other. (3) If the mountain or hill where the discovery has been made is capable of admitting the extent of concession solicited.

Art. 59. After the measurement has been effected in the manner set forth in Sec. 5 of this Code, if found to be complete and legally correct, and after hearing has been given to the Government Solicitor, the corresponding title deeds of ownership shall be extended.

Art. 60. For the title deeds of the concession of a mine the interested party must pay previously \$200 to the National treasury.

Art. 119. A miner is the exclusive owner within the boundaries of his concession, and to an unlimited depth, not only of the vein or deposit denounced, but of all other veins, crossings, and mineral substances that may be found therein, as also of the water proceeding from the underground works.

Art. 124. Neighboring mine owners have the right to inspect an adjoining mine personally or by means of an engineer or expert nominated by them, or by the Judge in case of opposition, whenever they suspect that a trespass has been effected, or they fear an inundation or other damage of similar nature, or if they believe that by means of a geological examination they can acquire some data useful to their respective exploitations.

Art. 174. Companies consisting of at least three persons, substantiated by presentation of their articles of association, may claim a maximum concession of 60 superficial hectares if they are discoverers outside a radius of five kilometres of a registered mine; and also a maximum of 40 hectares if the mine discovered be within that radius.

*Translated for the Guatemala Post, Tipografia Nacional, Guatemala, C. A.

Electrically Driven Power Shovels.

The largest electrically operated power shovels ever constructed, having buckets of 4 cu. yd. capacity, and equipped with Westinghouse motors and automatic control, have recently been placed in the service of the Dolese & Shepard Co., of Chicago, for mining rock in its limestone quarries. The hoist movement of these two 110-ton machines is actuated by a 200-hp., 220-volt, series-wound, direct-current



Power Shovel Showing Swing-Boom.

Westinghouse type M. T. mill motor running at 415 r. p. m.; the thrust motor, controlling the movement of the dipper handle is an 80-hp. machine of similar type, while the swing-boom is operated by an 80-hp. motor. Each motor is controlled independently by Westinghouse type 'A' automatic magnetic switch controllers which secure the greatest nicety of operation of the heavy bucket. This form of control protects the motors from any heavy overloads which may result from the bucket striking solid rock or other obstruction, by opening switches to introduce resistance into the motor circuit. The control panels and resistances are mounted in the rear of the car, while the controller handles are conveniently placed under the hand of the operators.

The hoist and swing-boom motors are mounted within the car, as shown in one of the accompanying illustrations, which show the installation of the 200-hp. hoist motor in the foreground. The thrust motor is placed out on the boom, communicating its motion to the bucket staff through reducing gearing connected to a pinion engaging a rack on the staff. The power circuit to the shovel is completed through a feed cable, carried on a retractile reel on the shovel cab, and through the rails on which the shovel advances.

The shovel may also be fitted with a standard trolley for driving power for propulsion on ordinary electrified track. The machine may then attain a speed of five miles per hour.

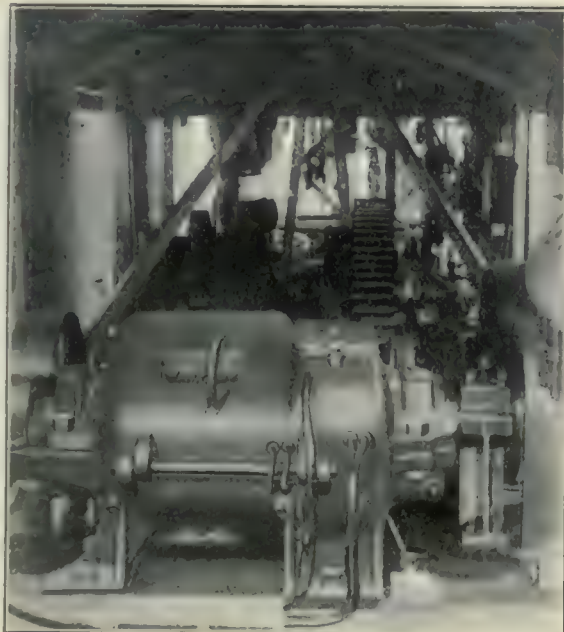
Compared with the steam-shovel, the electric-driven excavating apparatus has been found to present marked advantages of simplicity, economy, and ease of operation. The hauling of water and coal is avoided, fewer operators are required to handle the machine, and a considerable saving of time is noted. For example, the cost of operating a certain electric shovel with 75-hp. hoist, 30-hp. thrust, and 30-hp. swing-boom is \$0.0164 per cubic yard of gravel, clay, and sand, while similar work performed by steam-shovels would cost from 3 to 4c. per cubic yard.

Coal Output of Missouri.

The total production of coal in Missouri in 1908, according to statistics collected by the U. S. Geological Survey under co-operative agreement with H. A. Buehler, State Geologist, was 3,317,315 short tons, having a spot value of \$5,444,907. In Missouri, as in Arkansas, Kansas, and Oklahoma, the coal-mining industry in 1908 was adversely affected more by the increased production and consumption of petroleum and natural gas in the Mid-Continent field than by the business depression. Natural gas from the eastern Kansas fields is now piped to Kansas City, St. Joseph, and Joplin, Mo., and to Atchison, Leavenworth, Lawrence, Arkansas City, Winfield, Wichita, Wellington, Hutchinson, Pittsburg, and Galena, Kansas. Oil from the same fields and from northern Oklahoma is being extensively used for fuel at Kansas City. These conditions have naturally affected the coal production of Missouri. The coal-mining industry of the State reached its maximum production, 4,238,586 short tons, in 1903. It decreased slightly in 1904, 1905, and 1906; rose somewhat in 1907, to 3,997,936 short tons; but decreased again in 1908 by 680,621 short tons, or 17.02%, in quantity, and by \$1,095,802, or 16.75% in value.

THE ASBESTOS mined and sold in the United States in 1908 was mined in Georgia and Vermont, and the total output of the various grades was 936 short tons, an increase from 1907 of over 42%. The total value of the output of refined asbestos in 1908 was \$19,624, as compared with \$11,889 in 1907, an increase of 64%. According to the report on

asbestos by J. S. Diller of the U. S. Geological Survey, the increase in value thus indicated is due to the greater production than ever before of chrysotile, the variety of fibrous mineral which is best adapted to textile processes and com-



Motors for Driving Power Shovel.

mands the highest prices. The main source of raw material, however, continues to be Canada, whence came all but \$1646 worth of the imports into the United States in 1908, valued at \$1,068,322. Much over half of the asbestos exported by Canada came to the United States. The United States leads all other countries in the manufacture of asbestos products.

Publications Received.

Any of the books noticed in these columns are for sale by or can be procured from, the MINING AND SCIENTIFIC PRESS.

THROUGH YUKON AND ALASKA. By T. A. Rickard. 8vo., pp. 384, Ill., Index. MINING AND SCIENTIFIC PRESS, San Francisco, 1909. Price \$2.50.

There have been many books on Alaska, written from many points of view. In general they have been either tourist guides or scientific treatises. Much has been made of the mysteries of the country and the hardships of life in the Far North have been told with wearisome reiteration. Mr. Rickard's book is neither a tourists' guide nor a heavy technical treatise. It is a straightforward but lively account of a most interesting region and its people. It is a cheerful Far North which he gives us, whether he is speaking of Dawson, when the "women in white frocks, and a sunny cheery look in the faces of man and nature all bespeak the spring following a long winter," where "every patch of soil not covered by dwellings is green with new grass and bright flowers," or is describing Front street at Nome, which, he says, "has more character than the thoroughfare of any other American mining camp." "As Cairo is the meeting place of the Eastern and Western civilizations, so Nome is the spot where the people of the Arctic mingle with the invaders from the Temperate zone." "The Esquimo give color to the scene; the women in their pink and yellow parkas and wolverine hoods look like ladies on their way to a party; stalwart miners in high laced boots and stiff broad-brimmed hats recall Colorado and Nevada, and women dressed conventionally indicate that Nome has homes as well as mines." So we sit with him in the Royal Cafe and enjoy the silver salmon, reindeer steak, ptarmigan, blueberry pie, and the demi-tasse, and as the Havana cigar disappears we realize, with just a bit of sadness maybe, that our last frontier is about gone and Nome is really "no jumping-off place but on the highway of civilization from New York to Paris via Bering Strait."

The new land, however, has brought new problems in engineering, commerce, and government. These are all discussed thoughtfully. The great mines at Treadwell, the Yukon ditch, river transportation, the history of the anarchy at Nome, the pros and cons of a separate legislative body for Alaska, are presented fully but with that optimistic touch which is the best evidence that Mr. Rickard has got hold of the real spirit of the country.

It is a book to read if you are going North, and a book to read if you are staying at home. If Congress is to legislate wisely regarding our far northern Territory, the people at home must be informed regarding it. When they can get information and at the same time as much pleasure as the reading of this book gives, they are in luck. The word pictures and sober text are reinforced by nearly 200 illustrations of unusual beauty that make the country real even to the reader who gets no nearer Alaska than his own study.

MINERAL PRODUCTIONS OF ILLINOIS IN 1908. By R. S. Blatchley. State Geol. Survey, Circular No. 5, pp. 20. Urbana, 1909.

The figures collected by Mr. Blatchley show that Illinois produced in 1908, \$130,576,694, a decrease of 14.2% from the mineral output for the previous year. As was to be expected, coal showed the heaviest decline, falling from 51,317,146 to 47,608,161 tons. The general decline due to unfavorable industrial conditions was largely offset by increase in petroleum production.

EXERCISES IN SURVEYING FOR FIELD-WORK AND OFFICE-WORK. By John Clayton Tracy. 8vo., pp. 169, Index. John Wiley & Sons. New York, 1909. Price \$1.

This is a tremendously suggestive little volume; a stimulator. Professor Tracy is an excellent interrogator, and he has enquired into the details of surveying so curiously that his list of questions covers a multitude of points, many of which conceivably may never have occurred even to old practiced surveyors. The book is divided into sections dealing with every problem that can arise in plane surveying, giving equipment necessary, outline directions for the work,

necessary notes to take, and a series of questions relating to the minutiae of accuracy. The work is supplementary to the author's treatise on surveying, but it is of great value in itself. No surveyor could peruse it without discovering many things which he probably could not answer. It thus will serve to enable one to subject his own deficiencies to the test. It will also be invaluable as an aid to instructors in surveying.

FIRE-RESISTING PROPERTIES OF VARIOUS BUILDING MATERIALS. By R. L. Humphrey. U. S. Geol. Survey, Bull. 370, pp. 99, Ill. Washington, 1909.

This report contains the results of tests of thirty panels of various materials, made at the Underwriters' Laboratories at Chicago, Ill. The materials were subjected to direct heat for two hours and then quenched with water. The low heat-transmission rate of portland cement mortars and concretes was strikingly shown, as were many other facts of general interest and large practical value.

SUMMARY REPORT FOR 1908, MINES BRANCH, DEPARTMENT OF MINES, CANADA. By Eugene Haanel. Pp. 93. Ottawa, 1909. Price 10 cents.

A brief general statement of a large amount of interesting and valuable work.

SMOKELESS COMBUSTION OF COAL IN BOILER PLANTS. By D. T. Randall and H. W. Weeks. U. S. Geol. Survey, Bull. 373, pp. 185. Washington, 1909.

A consideration of principles, with results of Government experiments, and a chapter on central heating plants.

Commercial Paragraphs.

The WOOD DRILL WORKS, Paterson, New Jersey, has lately sold ten of its 3¼-in. drills to the California-Nevada Copper Co., at Juneau, Utah.

The CUTLER-HAMMER MFG. Co., Milwaukee, maker of electric controlling devices, announces the opening of a Philadelphia office, Room 1207 Commonwealth Building.

The hydraulic elevator being installed on the property of the Yukon Gold Co., on Bear creek, Yukon Territory, is of the Campbell type manufactured by the Hydraulic Supply Mfg. Co., Seattle, Washington.

THE FOOS GAS ENGINE Co., Springfield, Ohio, has recently received an order from the United States Government for six Vertical Foos engines, for use in the operations of locks on the Ohio river. Natural gas will be used for fuel.

THE *Technical Index*, published in Belgium, will be represented hereafter in the United States by the Geo. H. Gibson Co., Tribune Bdg., New York City. The *Technical Index* appears monthly and gives a systematic descriptive record of original articles appearing in over 200 engineering and technical journals and reviews, also indexing the proceedings of technical societies and technical books issued in all countries. It is stated that over 1000 original articles are indexed each month, covering all lines of engineering and technology. The American agents offer to send free sample copies upon request.

Catalogues Received.

THE JEFFREY MFG. Co., Columbus, Ohio, in its latest bulletin, No. 18A, describes the improved type of air-power coal cutter now manufactured by that company.

L. VOGELSTEIN & Co., New York, give the following figures for German consumption of foreign copper for the months January to May, 1909:

| | Tons. |
|-------------------|--------|
| Imports | 65,956 |
| Exports | 2,648 |
| Consumption | 63,308 |

As compared with consumption during the same period in 1908, of 68,893 tons. Of this quantity 60,353 tons were imported from the United States.

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TABLE OF CONTENTS.

EDITORIAL:

Notes Page. 205

Portland Cement and Monopoly..... 206

GENERAL MINING NEWS..... 209

SPECIAL CORRESPONDENCE 214

CONCENTRATES 220

DISCUSSION:

Gold in Eastern Nicaragua.....

.....Clarence Carleton Semple 221

Platoro, Colorado.....Chas. S. Barnes 224

ARTICLES:

Yampa Smelter, Bingham, Utah..Leroy A. Palmer 225

Innoko Alaska District..... 228

Classification of Public Lands...George Otis Smith 229

Ruby Mines of Mogok Valley, Burma.....

.....E. A. Wakefield 231

Mining in Oaxaca, Mexico.....E. M. Lawton 232

Platinum and Gold Losses in Dredging.....

.....W. B. Winston 234

Petroleum Production in 1908..... 236

DEPARTMENTS:

Personal 208

Obituary 208

Market Reports 208

Company Reports 235

Commercial Paragraphs 236

Publications Received 236

Catalogues Received 236

EDITORIAL.

TELEPHONES are to be installed in Pekin by the Western Electric Company, and much pleasant talk regarding the matter is being exchanged.

REPORTS from Bulawayo, South Africa, affirm the discovery of gold deposits similar to the Rand banket, in the Abercorn district of British Central Africa. The new goldfield is said to cover an area six miles long.

DIVIDENDS were deferred on the stock of the International Smelting & Refining Company, contrary to expectation. It is thought, however, that present available income will warrant the payment of regular semi-annual dividends of 3 per cent.

TITUSVILLE, Pennsylvania, will celebrate August 28, the semi-centennial of the drilling of the first oil-well. Drake's 69-foot well, producing 40 barrels per day, would not be ranked as much of a producer in many of our oilfields today, but in its influence on industrial history it outranks them all. It was not the discovery of oil, for that was already known, but the development of satisfactory methods of drilling, which made Drake's work important.

MEXICAN politics seem to have experienced a fall in temperature. Gen. Bernardo Reyes has formally withdrawn from the candidacy for vice-president. Some enthusiastic Reyista clubs have declined to accept this decision of their leader, but the impression is that General Reyes is sincere in his determination. The transfer of Gen. Gerónimo Treviño to the third military zone, which includes the State of Coahuila, has been attended with enthusiastic ovations on the part of the people of Monterey. Meanwhile Governor Miguel Cárdenas of Coahuila steps aside, and Lic. Praxedes de la Peña is expected to take the post. Thus the Reyista influence seems to have subsided, with the patriotic connivance of the man himself.

GOLDFIELD is making preparations to entertain the American Mining Congress handsomely. The mines and the big mill of the Goldfield Consolidated are to be freely open to visitors. The State is collecting material for a special exhibition of its mineral resources and the whole of Nevada expects to keep open house. The opportunity to see new developments as well as to visit the historic Comstock near-by, will be unusual. Plans are under way for a large delegation from California. This is as it should be. Since the days when California miners flocked into the newly discovered Washoe district, the relations of Nevada have been peculiarly close to the chief Coast city. Many San Francisco buildings have been paid for

with gold or silver taken from Nevada mines, and many Nevada properties have been developed by technical skill and capital from the Coast. The relation has been one of mutual helpfulness. The meeting of the Congress in Nevada will afford an opportunity of cementing this friendship and promoting mutual acquaintance.

ANOTHER coruscating meteor has fallen ingloriously to earth out of the sky of mining high finance. The American Exploration Company has been the subject of anxious inquiries from many quarters; whoever has been approached by this concern has felt desire for further knowledge. Now the unconsumed remnant is being examined by the courts, and Mr. Henry I. Kowalsky seeks possession of the *reliquiae*. The company has been promoting mines near Yosemite National Park, California, and has caught in its trap many notable people in France, Belgium, and Spain.

SUCTION dredges have never proved successful in elevating gold-bearing gravel from river channels. Gold finds its way into clefts and fissures in the bedrock beyond the reach of the suction apparatus. Reports of favorable results with such appliances appear frequently in the public print, and novices are led to make unfortunate investments under the allurements of so plausible a method. Until someone shall devise an intake with intelligence enough to work its way into every inequality of the bedrock, suction dredges must continue to do the plebian work of deepening water-ways and filling marsh-lots for seaside resorts. Conditions favoring its application to auriferous gravels would need to be most exceptional.

MAZATLÁN, the largest port town on the West Coast of Mexico, will become a smelting centre, according to rumors which bear the mark of authenticity. The project has the backing of the Southern Pacific Company of Mexico. While reports fail to associate the two, it is reasonable to suppose that this enterprise must be connected with the old Mina Cobriza at Villa Union, thirty miles from Mazatlán. To erect a smelter in Sinaloa today, dependent upon custom ores and mattes would be anticipating development to such an extent as to invite disaster. In conjunction with a mine which could furnish raw material for the furnaces, however, a smelting industry at Mazatlán would encourage rapid exploitation of the copper deposits of the tributary district, that also yield considerable quantities of the precious metals. The Mexican Government has recently appropriated \$30,000,000 for the improvement of the harbor of Mazatlán, which should make it one of the finest ports on the Pacific. It is a land-locked bay of large size, but shallow, and obstructed by dangerous rocks at the entrance. The sum mentioned seems ample to create a harbor of the first class. With the shipping facilities to the north through Sinaloa and Sonora, and southeastward through Tepic and Jalisco, provided by the new railroad, this would become a natural focus for ores and other metallic products from a large area.

APPARENTLY copper quotations in future will depend upon actual demand for bona fide delivery of the metal. The New York Metal Exchange received a stunning blow from the committee headed by Mr. Horace White, that recently revealed "the forms that creep" in the under-waters of Wall Street. This particular Exchange met with so scathing a rebuke that action by the legislature to revoke its charter is regarded as almost certain. Reforms are consequently being made, in an effort to avert such an occurrence. A metal exchange is necessary. If this one cease to exist, another must fill its place. Reform of the abuses of a working institution are more practicable than the construction of a new one that shall perform its functions without friction. Among these reforms was the abolishment on August 2 of the quotation committee, which has in the past arbitrarily fixed the price of copper from day to day. The committee consisted of Messrs. L. Vogelstein, Harmon Hendricks, W. Parsons Todd, B. Hochschild, and Paul Konig, representation of the leading American and foreign concerns having been thus maintained. New rules for effecting deliveries of copper have been drafted, and it is expected that refinery receipts will in future be made negotiable.

Portland Cement and Monopoly.

Despite the prevailing business depression, and contrary to all estimates, cement production in the United States in 1908 showed a small increase. The total output for the year, according to figures compiled by Mr. E. C. Eckel for the United States Geological Survey, amounted to 52,910,925 barrels, selling for \$44,477,653. Of this, much the larger and more valuable portion consisted of portland cement, of which the output was 51,072,612 barrels, valued at \$43,547,679. This was an increase of 4.6 per cent in the output over the figures for the preceding year, but a decrease of 19.3 per cent in value. A closer analysis of the figures shows that the increased production came principally from the Universal Portland Cement Company, and subordinatedly from plants in the Middle West. In the Lehigh district of Pennsylvania and New Jersey there was an actual decrease of 4,217,299 barrels, so that the plants of the United States Steel Corporation and the independent plants through the West, not only absorbed all the new business but grew at the expense of the group which has long dominated the cement industry in this country. This is especially interesting in view of the determined efforts which have been made by the older companies to maintain their position.

The rapid development of the portland cement industry in the United States is one of the most striking features of our recent economic history. From an output of 42,000 barrels in 1880, 335,500 in 1890, and 8,482,020 in 1900, the production grew to 51,072,912 barrels in 1908. The growth from 1895 to 1905 was especially rapid, the output increasing in a single decade from 990,324 to 35,246,812 barrels. The reasons for this increase are many.

Portland cement was first made in the United

States in 1876 and exhibited at the Centennial Exposition, but in 1880, of the six plants which had been started, three had proved commercial failures. In 1882 when the Morell tariff bill was under consideration in the Senate, it was argued that cement should be put on the free list because there was no raw material for its manufacture in the United States, and a domestic industry could never be developed.

The early plants failed, apparently mainly because the processes then in use were too complex. The introduction of the rotary kiln, of coal-dust burning, improvements in fine grinding, the discovery of widespread materials, standardization of tests, rise in the price of lumber, education of the public in the use of cement, and the great industrial prosperity of the country, combined to develop the industry to an enormous extent and with remarkable rapidity.

Production on a large scale began in the East, and in the Lehigh district material was found of approximately correct composition to produce a superior cement. As its worth became recognized the prejudice in favor of imported cements was broken down and American plants multiplied. In 1890, however, the Lehigh plants produced 60 per cent of the total output. In 1897 they manufactured practically 75 per cent. From this position they dropped relatively, though their output increased absolutely, until in 1907 only half the output came from the Lehigh district, and in 1908 a trifle less than 40 per cent was made there.

The first plants were highly profitable, and the pioneer manufacturers desired to maintain as far as might be, their dominant position; a not unnatural desire when the long lean years of experiment and development between 1880 and 1890 are remembered. Cement making materials, as it happens, are widely distributed, and the market, while varying in density is also a universal one. Cement, furthermore, is bulky and heavy so that transportation charges at many points of delivery exceed manufacturing costs at the factory. All these factors work against any effective combination to control the industry and centre the manufacture at a few points. Under the leadership, however, of the Atlas Portland Cement Company, one of the largest and most successful of the Lehigh companies, combination was attempted. The North American Portland Cement Company was formed by consolidation of the so-called 'big six', the Alpha, Atlas, American, Lawrence, Lehigh, and Vulcanite companies. By acquiring stock ownership and building branch plants at strategic situations, the attempt was made to dominate the market. These methods were backed by the interchange of technical data, by systematic experiment, and by liberal and most judicious advertising, all of which were relied on to give the favored group the benefits realized earlier by the members of the German Portland Cement Manufacturers Association. These vigorous efforts were not without effect, but as the statistics already quoted show, they have not availed to build up a monopoly in the face of the large market, the widespread raw material, and a series of years of easy

money. The final reliance of the group attempting to build up a monopoly of this great industry has been the ownership of the Hurry and Seamon patents on apparatus used in burning coal-dust in the rotary kilns. There is some question as to the extent and validity of the claims made under these patents, and the matter has been in the courts for some time. Following one decision in favor of the patents a number of the independent companies surrendered and took out licenses to manufacture. Others have continued to fight, and testimony in additional suits is now being taken. The prize is well worth fighting for since the royalty, while small per barrel, would in the aggregate amount to a princely sum per annum. In a hard year, also, such as the last one, an addition of even a few cents to costs forms a handicap which may prove fatal. In 1908, the average price per barrel at the plant was 85 cents and much cement was sold for less. In Kansas City good portland went at 70 cents and at such prices even the smallest royalty would prove a serious matter.

At present there are three groups in the cement industry: (1) the so-called 'cement trust' which controls the old Lehigh district, and the patents mentioned, and is endeavoring to regain its dominant position; (2) the independent manufacturers, mainly in the Middle West; (3) the Universal Portland Cement Company, a subsidiary of the United States Steel Corporation. As has already been shown the two last named groups have been gaining on the first and older group both through prosperous and hard years. So far the Universal company has not been drawn into the patent litigation though there are rumors that it is about to take a hand. This would doubtless result in a battle royal.

The Universal company has had in some particulars the most difficult fight to gain its present position. Its product is made of granulated slag and ground limestone and the possibilities of the business are enormous, particularly in view of the present widespread tendency to combine steel and cement in modern construction. Prejudice, however, dies hard and it took years to convince the public that a true portland cement could be made of these materials. In 1900 less than half of one per cent of the total output of the country was made from slag. In 1908, 8.9 per cent or 4,535,300 barrels was so made, a truly magnificent technical and business triumph in the direction of using by-products.

As to monopoly or anti-monopoly of cement manufacture in this country, much may be said on both sides. It would be a national calamity to have this cheap and widespread building material, one of our main resources for future structural work, burdened unnecessarily. On the other hand a disorganized industry, the prey of swindling promoters and faced by extreme irregularities in prices, is a national liability. Sooner or later the consumer pays the bill and with a manufacturing capacity estimated at 103,000,000 barrels, and an annual output of approximately half that amount, it is not surprising that manufacturers are looking for some steadying influence.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

BEDFORD McNEILL is in Switzerland.

R. A. VARDEN has sailed for Colombia.

CURTIS H. LINDLEY is at Wardner, Idaho.

CHARLES BUTTERS is at Carlsbad, Germany.

J. ROSS BUET has left London for New Zealand.

F. A. GOWING has returned from Oaxaca, Mexico.

F. W. BRADLEY is at the Alaska Treadwell mine.

LEO VON ROSENBERG, of New York, is in Wyoming.

JAMES DOUGLAS will remain in England for the summer.

R. H. B. BUTLER is on his way from London to Mexico City.

W. MURDOCK WILEY has returned from Mexico to New York.

W. E. THORNE has returned from Brazil, and is at New York.

HORACE G. NICHOLS left British Columbia for London, August 13.

A. W. G. WILSON has been at Golconda and Bromptons Lake recently.

C. S. HERZIG is in London. He will return to Nicaragua in September.

RALPH ARNOLD has returned from Mexico and has been in San Francisco.

R. H. BURROWS is now with the Moctezuma Copper Co. in Sonora, Mexico.

A. C. REDDING has been appointed a Deputy Mineral Surveyor for California.

M. R. RICHARDSON is with the Mazapl Copper Co., Ltd., at Concepcion del Oro, Zacatecas, Mexico.

FREDERICK GRUNDY has returned to Los Angeles from examining mines near Needles, California.

W. R. CRANE has been visiting mining districts in the West and was in San Francisco this week.

GEORGE M. ROBERTS, manager of the Associated Gold Mines of Western Australia, is in London.

T. H. LEGGETT underwent an operation for appendicitis at New York, and is convalescing satisfactorily.

W. L. BOWBON has been appointed superintendent of the Gold Hill & Iowa mines at Quartzburg, Idaho.

D'ARCY WEATHERBE will return in September to the Rio Tinto mines, where he is one of the chief engineers.

ALFRED VON DER ROPP is expected in San Francisco, where he will hereafter represent the Consolidated Gold Fields of S. A., Ltd.

H. P. GARTHWAITE has returned from London, and has left for Copala, Sinaloa, and will thence proceed to Salvador, Central America.

JOHN G. WORTH is on a tour of inspection of the properties of the Worth American and Worth Exploration companies in Colorado, Utah, and Nevada.

S. E. BRETHERTON has been retained as consulting engineer by the Lodi Mines Co. of Nevada, for their smelter, which is designed to treat extremely rich ore, low in lead content.

FRANK L. SIZER is in Sandon, British Columbia, in connection with the Star-White extra-lateral right case, which has recently been decided in favor of the plaintiff after five years' litigations in the courts of Canada.

Obituary.

R. D. EVANS, who died recently at Boston, Massachusetts, was well known in mining circles. As president of the Yuba Consolidated Goldfields at Hammononton, he had much to do with the development of dredging in California, and his loss will be keenly felt.

Latest Market Reports.

LOCAL METAL PRICES.
San Francisco, August 12

| | | | |
|--------------------------|--|-------------------------|--|
| Antimony | 12-12 ³ / ₄ c | Quicksilver (Bask)..... | 44-44.50 |
| Electrolytic Copper..... | 15 ¹ / ₂ -16 ¹ / ₂ c | Spelter | 6 ¹ / ₂ -7 ¹ / ₂ c |
| Pig Lead..... | 4.60-5.55c | Tin | 32-33 ¹ / ₂ c |

METAL PRICES.

By wire from New York.
Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|-------------|-------------------------|-------|----------|--------------------------------|
| Aug. 6..... | 12.93 | 4.29 | 5.59 | 50 ³ / ₈ |
| " 7..... | 12.93 | 4.29 | 5.63 | 50 ³ / ₈ |
| " 8..... | Sunday. No market. | | | |
| " 9..... | 12.93 | 4.29 | 5.6 | 50 ³ / ₈ |
| " 10..... | 12.93 | 4.31 | 5.70 | 50 ³ / ₈ |
| " 11..... | 13.00 | 4.31 | 5.73 | 51 |
| " 12..... | 13.12 | 4.34 | 5.73 | 51 |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Aug. 5. £ s. d. | Aug. 12. £ s. d. | |
|------------------------|--------------------|-------------------------------------|---------|
| Camp Bird..... | 1 7 3 | 1 5 0 | ex div. |
| El Oro..... | 1 5 6 | 1 5 6 | |
| Esperanza..... | 2 16 3 | 2 16 10 ¹ / ₂ | |
| Dolores..... | 1 10 0 | 1 10 0 | |
| Oroville Dredging..... | 0 12 6 | 0 12 3 | |
| Mexico Mines | 6 9 0 | 6 10 0 | |
| Tomboy..... | 1 1 3 | 1 1 3 | |

(By courtesy of W. P. Bonbright & Co., 24 Broad St. N. Y.)

MINING QUOTATIONS—NEW YORK.

| | Closing Prices. | |
|---------------------------------------|--------------------------------|---------------------------------|
| | Aug. 5. | Aug. 12. |
| Amalgamated Copper..... | 84 | 88 |
| American Smelting & Refining Co | 98 ¹ / ₂ | 103 ¹ / ₂ |
| Boston Copper..... | 15 ³ / ₄ | 16 ³ / ₄ |
| Butte Coalition..... | 25 ³ / ₄ | 26 ³ / ₄ |
| Cumberland-Ely | 7 ¹ / ₂ | 7 ³ / ₄ |
| Dolores..... | 6 | 6 ¹ / ₂ |
| El Rayo..... | 2 ¹ / ₂ | 2 |
| Giroux..... | 9 ³ / ₈ | 10 |
| Greene-Cananea | 10 ³ / ₄ | 10 |
| Indiana Sonora | 3 | 3 ¹ / ₄ |
| La Rose..... | 8 | 8 |
| Miami Copper..... | 16 ³ / ₄ | 16 ³ / ₄ |
| Nevada Consolidated..... | 24 | 24 ³ / ₄ |
| Newhouse | 2 ¹ / ₄ | 3 ¹ / ₄ |
| Nipissing..... | 10 ³ / ₄ | 10 ³ / ₄ |
| Ohio Copper..... | 4 ¹ / ₂ | 5 ¹ / ₂ |
| Tennessee Copper..... | 38 ¹ / ₂ | 39 ¹ / ₂ |
| Utah Copper..... | 51 | 53 ¹ / ₂ |
| Yukon..... | 5 ³ / ₄ | 5 ³ / ₄ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St. N. Y.)

COPPER SHARES—BOSTON.

| Closing Prices. | | Closing Prices. | |
|--------------------------|--------------------------------|---------------------------|--------------------------------|
| August 12. | | August 12. | |
| Adventure..... | 7 ¹ / ₄ | Mohawk | 65 |
| Allouez..... | 47 ³ / ₄ | North Butte | 56 ³ / ₄ |
| Atlantic..... | 12 | Old Dominion | 58 ¹ / ₂ |
| Calumet & Arizona | 109 | Osceola..... | 147 |
| Calumet & Hecla..... | 695 | Parrot..... | 32 ³ / ₄ |
| Centennial..... | 36 ¹ / ₂ | Santa Fe..... | 21 ¹ / ₂ |
| Copper Range..... | 84 ¹ / ₂ | Shannon..... | 16 ¹ / ₂ |
| Daly-West..... | 9 ¹ / ₂ | Superior & Pittsburg..... | 17 ³ / ₄ |
| Franklin..... | 17 ¹ / ₂ | Tamarack | 72 |
| Granby..... | 104 | Trinity..... | 13 ¹ / ₄ |
| Greene-Cananea, ctf..... | 10 | Utah Con | 47 ¹ / ₄ |
| Isle Royale..... | 29 ³ / ₄ | Victoria..... | 4 ³ / ₄ |
| La Salle..... | 16 ³ / ₄ | Winona..... | 6 ¹ / ₂ |
| Mass..... | 8 | Wolverine..... | 155 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, August 12.

| | | | |
|----------------------------|-------|-----------------------------|-------|
| Atlanta..... | \$ 18 | Mayflower..... | \$ 12 |
| Belmont..... | 85 | Midway..... | 21 |
| Booth..... | 14 | Montana Tonopah | 75 |
| Columbia Mtn..... | 10 | Nevada Hills..... | 80 |
| Combination Fraction | 68 | Ophir (Comstock) | 1.40 |
| Daisy..... | 26 | Pittsburg Silver Peak | 46 |
| Fairview Eagle..... | 18 | Rawhide Coalition | 22 |
| Florence..... | 3.15 | Round Mountain | 70 |
| Goldfield Con | 6.90 | Sandstorm | 8 |
| Gold Kewenas..... | 10 | Silver Pick | 16 |
| Great Bend..... | 8 | St. Ives..... | 9 |
| Jim Butler..... | 10 | Tonopah Extension | 56 |
| Jumbo Extension..... | 20 | Tonopah of Nevada | 6.85 |
| MacNamara..... | 29 | West End | 58 |

General Mining News.

ALASKA.

(Special Correspondence).—In the Harris mining district, 12 miles from Juneau, an important discovery of gold ore was made late in June, 1908, by Thos. Dull and John Stevens, of Juneau, followed by the Wiley & Spaulding discovery in July. No secret was made of the find and specimens of rich gold ore were brought into Juneau and exhibited. This created an excitement, and since that time the country for miles around has been staked out, and every small launch and row-boat in Juneau and Douglas has been put into use by the prospectors. On the Salt Water Jack, and Stephens and Dull claims, visited by me, the owners have made good profits by ground-sluicing and 'mortaring' the oxidized rock. In this way the properties have paid for their own development. The vein runs through the country northwest and southeast in contact with a dike of diorite on the hanging wall side. The vein has a dip of about 15% to the northeast, and varies from 15 to 30 ft. in width. Fissure veins cut the main vein at frequent intervals, and here rich ore is found. The fissure veins cutting the main one run high in gold, but the ore as a whole may be considered low-grade. The country is hard to prospect owing to the fact that soil covers the surface and vegetation is abundant. Roads are being built, and work is being pushed on all the claims. The district is making a good showing and is attracting great attention. The Ebner mine in the Silver Bow basin has been sold, and a party representing the purchasers is now in Juneau making arrangements to start operations before the season ends. The mill will probably be enlarged, and mining carried on more extensively than heretofore.—The Mills property on Chichagoff island, of which W. H. Mills, of Sitka, is president, has a new 10-stamp mill installed, and, in co-operation with the Chichagoff Mining Co., has built a hydraulic power-plant which is to transmit power to the mines, a distance of five miles.—At Nevada creek, Douglas island, on the Alaska Treasure group, several buildings have been erected and a new tunnel is to be driven in from the bench a distance of 3000 ft. The work is under the direction of D. J. Argall.—The Perseverance Gold Mining Co.'s mine in the Silver Bow basin is operating steadily. The transmission wires are now being strung from the power-house on Sheep creek to the Perseverance. The power is to be generated by a large stationary gas-engine. A working bond has been taken on two mining properties in this vicinity by Pittsburg people, but the details are not made public. At Gypsum bay, a large force of men is engaged in mining the big gypsum deposit, under the management of T. H. George.—The Crystal Gold Mining Co., of Snettisham, is operating an excellent ore. Next spring the mill's capacity will be increased. Martin Olson, of Juneau, is the manager.

Juneau, July 21.

ARIZONA.

COCHISE COUNTY.

In April of this year the Copper Queen Consolidated Mining Co. replaced a portion of its timbers in drift 3-101 on the 300-ft. level with steel I-beams. These proved unsatisfactory in swelling ground and were replaced by sets of double-bracket beams. These also doubled under the strain, and are now being replaced by Oregon fir 12 by 12-in. timbers, which last 30% longer than either of the steel sets. The Sacramento shaft is being sunk from the 1500 to the 1700-ft. level. At the Spray shaft the shaft-house has been removed to facilitate ventilation. The precipitating plant of this company handling the water from the Czar shaft collapsed August 5 on account of the copper-water weakening the nails. The plant was 100 ft. square, 50 ft. high, and was damaged to the extent of \$5000.—The Mexico & Colorado railroad is completing a spur to the property of the Great Western Mining Co. at Courtland. The company has a large amount of ore on the dump ready for shipment. The first of this will be sent to the El Paso

smelter, as that plant needs this quality of ore to flux the material it is now handling.—Drifts from No. 11 cross-cut on the 300-ft. level of the Shattuck-Arizona have been driven over 500 ft. with raises over 50 ft. in ore.—The Bisbee Extension company is driving cross-cuts on the 400-ft. level in a low-grade oxidized ore. The company plans to sink to the 700-ft. level this fall.—A shot-drill has been started on the Geronimo property near Courtland.—The sum of \$14,330 has been raised for the further development of the Bermoudy-Turkey Creek property and a steam-driven compressor plant and five 2¼-in. drills added to the mine equipment.

GILA COUNTY.

The July output of the Old Dominion smelter was a trifle lower than the June, approximating 2,700,000 lb., 2,000,000 of which is credited to the Old Dominion mines. The cross-cut from the 14th level of the Old Dominion opened a body of smelting ore on that level of the Gladiator claim of the United Globe company. This orebody has been opened from the 10th level of the Old Dominion to the 14th level of the United Globe.—The double-compartment shaft which the Cactus Development Co. is sinking on the Pinto property near Globe is down 75 ft.—The cross-cut on the 600-ft. level of the Arizona Commercial Copper Co.'s mine cut an orebody at a distance of 350 ft. from the shaft.



Sacramento Shaft at Copper Queen Mine.

The Black Hawk winze is being sunk from the fifth to the sixth level in ore.—The power plant at the McGaw shaft of the Superior & Boston has been completed and the hoist is running satisfactorily.—The Sullivan shaft at the Cordova property is down 320 ft. A station is being cut on the 300-ft. level and cross-cuts will be driven to the ore.—The shaft of the Live Oak Development property is down 302 ft. and a station cut at the 218-ft. level.

SANTA CRUZ COUNTY.

The Industrial Mining Co., near Nogales, has resumed operations on its property which was shut down several months ago.

YAVAPAI COUNTY.

A drift has been started on the orebody recently cross-cut on the 500-ft. level in the Little Daisy mine of the United Verde Extension Mining Co. A winze is to be started shortly in the ore. J. J. Fisher is consulting engineer.—At the Derby mine, six miles west of Prescott, cross-cuts are being driven on the 300-ft. level. The company is to add 5 stamps to its mill shortly. George W. Young is manager.—I. F. Wilson has been employed by the Arkansas & Arizona Mining Co. to oversee the diamond-drill operations on its property. Considerable difficulty has been experienced on account of the hole caving and a portion of it had to be cemented, causing a loss of

time.—The Haynes Copper Co. has been forced to stop operations temporarily at its Jerome property on account of a heavy flow of water. A new pumping plant will be installed and work resumed. T. E. Campbell is superintendent.

YUMA COUNTY.

A vein assaying 14% copper and \$10 gold was intersected while cutting the station at the 100-ft. level of the Little Butte mine of the Little Butte Consolidated Mines Co. at Bouse. A 50-hp. hoist is being installed and ore-bins of 50 tons capacity built at the shaft. The average assay of the ore shipped from the mine is 10% copper and \$9 gold per ton.—A 74-ft. orebody was cut on the property of the Yuma Copper Co. in the Harcuvar mountains at a depth of 130 feet.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—The Bunker Hill paid in July two dividends of three cents per share, a total of \$12,000. The treasury contains \$65,850, and the mine is producing \$21,000 per month with 20 stamps.—The big vein recently cut at the 2100-ft. level of the South Eureka is said to be 18 ft. wide, assaying \$20 per ton.—The California Consolidated Mines Co. was recently organized with a capital of \$5,000,000 to operate the Keystone, Wildman, Mahoney, and other properties at Sutter Creek. Eastern people are chiefly interested.—A new cable 3050 ft. long was installed in the Kennedy shaft last week. The old cable has been moved to the north shaft. The main shaft is going down steadily and large quantities of excellent milling ore is coming from below the 3000-ft. level.—The Kennedy Extension has started to clean and repair the old shaft which is 1000 ft. deep. It is planned to sink it to the 1500-ft. point and cross-cut the vein.—The Crocker-Habrich-Holtz lease on Amador Queen is opening an excellent orebody. A carload running \$60 per ton has been shipped to the Selby smelter.—A number of small properties, that have laid idle for years, are being re-opened and actively exploited by eastern and southern Californian interests.

Jackson, August 9.

BUTTE COUNTY.

Lawrence Gardella is to install a dredge on the Mahle property. There are 220 acres in this ranch, all of which will pay the costs of dredging.

INYO COUNTY.

The Casa Diablo Mining Co. has just completed a three months run to test the efficiency of its plant and the cost of handling the ore. The foundations have been laid for a new motor and compressor, which should arrive at the mine in a few days.—The smelter at Keeler has been shut down for a few days to put a new water-jacket on the furnace.

NEVADA COUNTY.

The pipe-line to the McDonald ranch on Banner mountain has been completed and the steam-hoist is now in operation. From old surveys the channel is known to be near the surface at this point, so the company expects to cut the bedrock at an early date. S. T. Dille is superintendent.—The Black Swan mine at Mooney flat is to be re-opened. A 150-ft. shaft was sunk on the property several years ago, but the pumps were drowned out and the company stopped work. The machinery is being overhauled, and a larger pumping plant will be installed. A good body of gravel was cut by the shaft and short drifts run along the bedrock.—The foundations and framework of the Fairview mill have been started and a contract let to furnish the machinery.

SHASTA COUNTY.

A new dynamo was hauled to the hydro-electric plant at the Midas mine. The plant has been under construction for almost a year, and will now furnish power for the mine and mill, and lights for the town.—An oil seepage one mile south of Kennett has caused considerable excitement in that district and a number of claims have been

staked.—A contract has been let to sink the shaft on the James Sallee property at Old Diggings 250 feet.

SIERRA COUNTY.

M. I. Ish and associates have bonded the Big Boulder group of quartz and gravel claims 10 miles west of Downieville.—An adit is being driven to tap the channel on the Reese Ravine group. Allen Hubbard is in charge of the work.—The Oakland mine between Snake and Gold lakes is taking out some high-grade ore. Francis B. Voyle is in charge of the work.—Thomas Buckingham is repairing the mill at the Elsie mine and will run the ore from the Jim Crow through it.—The Haynes brothers are opening some excellent ore on their claims north of Poker flat.—The lower adit on the Bixby vein at Forest is in 130 ft. It will require 100 ft. more work to drive this under the shaft where the company will raise to the ore-shoot.

SISKIYOU COUNTY.

Representatives of Eastern capitalists are examining the Cariboo mine on Salmon river with a view to bonding it.

TRINITY COUNTY.

A company of Boston capitalists has been organized to dredge the farm of Clarey, Pane & Keenan near Trinity Center. Thirty holes have been sunk on the property, which is 500 yd. wide and one-half mile long, with satisfactory results. A small dredge operating on the property took out \$10,000 per acre recently. A large dredge will be constructed and the property worked on a royalty basis.—A new hydro-electric plant is being installed at the Headlight mine.

TUOLUMNE COUNTY.

The Tyro mine, one mile from Coulterville, is to be re-opened. There is a 10-stamp mill and complete surface plant on the property.—C. Leithold is working the tailing dump at the Mack mine.—The mill at the Mohican has been started and is running on high-grade ore from the mine.—Joseph Harten is taking some excellent ore out of the Little Wonder mine, upon which he has a lease.—The Shawmut mine has closed down to re-timber the shaft.—Drifts are being driven on the vein at the 100-ft. level of the Mangante mine near Jamestown.—Ore is being hauled from the Atlas mine to the mill at Tuttle town.—A cross-cut in the hanging wall of the Dead Horse mine, near Carters, cut a vein of free-milling ore 20 ft. wide.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—An agreement has been entered into between the Argentine-Montezuma M. M. T. & T. Co. whereby the Argentine Central railway will use the Vidler tunnel for the running through of trains into the Montezuma mining fields in Summit county. Under the terms of agreement work will at once be resumed in the advance of the bore and within seven or eight months the undertaking will be completed. The Argentine Central tracks now lead to the portal of the adit, while a branch line is to be constructed from the summit of McClellan mountain to Gray's peak, a distance of seven miles. By running through the Vidler bore the distance to Keystone and Montezuma will be shortened by nearly 75 miles over that of the Denver & Rio Grande railway. As a result nearly all the ores of Summit and Lake counties will find a route through Clear Creek county.—The Calla adit is being driven steadily forward and drifts run on the Calla vein. Recent shipments assayed \$32 per ton in silver and lead. R. C. Vidler, of Golden, is manager.—Work was put under way this week in the construction of the new 50-ton mill for the Griffith Mining Co., and it is hoped to have the plant ready to put into commission inside of 90 days. The Malm process of ore extraction is to be installed. W. D. Hoover, of Denver, is manager.—Occasional shipments of smelting ore are being made from the Big Indian. The ore is of high grade, assaying from 4 to 5 oz. gold and 70 to 180 oz. silver per ton. Stopping has been started.—The 25-ton mill of the Crescent Mining & Milling Co. is now running night and day producing an excellent concentrate. The first shipment of ore was made this week to the local sampler and milled 65% lead, with 40 oz. silver per ton. It

is reported that shipments of smelting ore will be started during the next two weeks. O. Needham is in charge.—Cappel & Co., leasing on the Gem mine through the Newhouse adit, made a shipment of 13 tons of ore last week that milled \$24 per ton gold and copper. These lessees have a body of ore that is from 7 to 12 ft. wide, and from this time forward a heavy output will be made.

Georgetown, August 9.

GILPIN COUNTY.

Marshall D. Draper is organizing a company to build a custom mill and cyanide plant at Central City.

GUNNISON COUNTY.

Eastern capitalists have purchased the Victor mine and are developing a new vein as well as opening the old workings. The new vein assays 175 oz. silver and 25% lead with some gold and copper. George Denoon is manager.—P. J. Tischhauser, N. Schmuser, and John Davison, operating the Black Queen mine at Crystal under a five years lease, have opened a large body of smelting ore besides the milling ore already blocked out in the mine. The property is equipped with a 60-ton mill that is connected with the mine by an aerial tram.

LAKE COUNTY.

An aerial tram has just been completed between the Tucson mine on Iron hill and the spur from the Denver & Rio Grande railroad.—William S. Jones, leasing the Robert Lee mine on Fryer hill, cut a 10-ft. vein of zinc carbonate that assays 25% zinc with a small amount of silver.—The Leadville District mill is treating ore from the dump of the old Ballard mine.

OURAY COUNTY.

F. M. Jackson and E. C. Weatherby, operating the Old Lout mine in Poughkeepsie gulch under a lease, have started to drift from the face of the 1800-ft. adit to get under the shaft. This will give them 600 ft. of backs.—The Koehler adit at the San Antonio mine opened a second body of copper ore within 10 ft. of the body cut last week. The adit is 350 ft. below the bottom of the shaft and a drift will be started to get under that point.—The drift at the Calliope mine is opening a shoot of silver ore 3 ft. wide. The mill and entire surface plant were destroyed by fire. The loss is estimated at \$20,000.—Two feet of ore assaying 150 oz. silver per ton was cut on the Sutton group of the Slick Brothers Mining Co. on Mt. Hayden. The company is doing considerable work in the upper level of the property to demonstrate the advisability of driving an adit that will tap the vein at a depth of 800 ft.—A new compressor has been installed at the Atlas mine and the work is being concentrated on the drifts to connect the Atlas and San Pedro workings.—A new hoist has been installed at the Legal Tender mine and the shaft is being sunk to cut the contact.—The Jonathan mine near Ouray is being re-opened under the direction of John Donald.—Contracts are to be let for driving 1400 ft. of drifts and cross-cuts on the Camp Bird Extension property of the Amity Gold Mining Co. Lumber for houses and supplies for the winter have been ordered and the company will keep the mine running all winter.—A raise is being driven 300 ft. in ore to follow the ore-shoot from the lower to the upper level of the Thistledown mine. The vein is 3 ft. wide and assays \$10 per ton.

SUMMIT COUNTY.

Operations have been resumed at the Sallie Barber mine on the north slope of Mt. Baldy. The ore is lead and zinc and the property is in the centre of the group operated by the American Zinc Extraction Co.—The Reliance dredge in French gulch was shut down temporarily to install a new bucket-line. The work has been completed and the dredge is again in operation.

TELLER COUNTY.

The Vindicator Consolidated Gold Mining Co. produced 3000 tons of ore during July. Of this amount 2000 tons averaging \$42 per ton were mined on company account and 1000 tons averaging \$24 were mined by lessees. The high value of the company ore was due to the recent discoveries on the 1300 and 1400-ft. levels.—A cross-cut from the Em-

pire State shaft of the Isabella Mining Co. cut a 6-ft. vein of shipping ore at the 900-ft. level.—The School Section Leasing & Development Co., operating on the eastern slope of Bull hill, shipped 27 cars of \$25 ore during July.—Peter V. Wild and J. P. Hein shipped 25 tons of ore from the Bill Nye claim of the Copper Mountain Gold Mining Co. The vein was cut at a depth of 135 ft. on a contact of phonolite and granite.—Martin & Warmuth cut a 5-ft. vein of high-grade ore at a depth of 40 ft. on the Star of Bethlehem claim.—Ed. Gaylord, operating the Jerry Johnson mine under lease, shipped a 25-lb. gold brick to the Denver Mint.

IDAHO.

IDAHO COUNTY.

E. J. Comley and W. F. Johnson are driving an adit on their Hercules claims that will give 80 ft. of backs. A raise will be driven from the lower adit 220 ft. below and the ore handled through this.—A rich discovery has been made on the claims of John Harmon situated on the south fork of Clearwater river. The outcrop has been traced the length of two claims.

KOOTENAI COUNTY.

The Gold Ridge Mining Co. is building a spur from the Chicago, Milwaukee & Puget Sound railway to the Copper Prince mine in the St. Joe district. When the spur is completed a compressor and other mining machinery will be shipped to the mine. The company will also install a compressor and hoist at the Gold Ridge mine. D. Davis of Cœur d'Alene City is manager.

SHOSHONE COUNTY.

Thomas L. Greenough, president of the Snowstorm Mining Co., is authority for the statement that the company will discontinue its shipments to the smelter at the expiration of the present contract. The companies operating in this district feel that the railroad rates are excessive and a strong fight for reduction will be made.—A cross-cut adit is being driven on the Full Moon property east of Burke that will give 400 ft. of backs on the vein. W. R. Kelsey is manager.—The Wonder Mining Co. cut a 12-ft. vein of lead carbonate in its lower adit. A drift has been started to get under the shaft sunk in the upper portion of the vein that will give 480 ft. of backs.—An excellent shoot of copper-lead-silver ore was opened by the drift on the Big Chief claims in the Osburn district. The group joins the Polaris mine and is connected with the O. R. & N. railroad by a good wagon-road.—The drift from the 800-ft. level of the Hypotheek mine near Kings-ton has been driven 125 ft. on a vein of chalcopryrite and gray copper ore. In the upper levels considerable galena was associated with the ore, but this has completely disappeared with depth. Frank Guay is manager.—A lower adit is to be driven on the Torino group near Mullan as the upper drift has broken into a shoot of galena, carbonate, and native silver ore. Joseph Pella is manager.—The first shipment of ore from the Bear Top mine assayed 81% lead, 5 oz. silver, and \$1 gold per ton.

MICHIGAN.

A contract for 10,000 ft. of diamond drilling has been let by the Mayflower Mining Co. The holes will be drilled through the sandstone on the eastern portion of the property where it is thought to overlie the copper-bearing formation. A number of good cores were taken from holes on the western side of the property, but development work proved that side to be pockety and too low-grade to be economically worked.

MONTANA.

SANDERS COUNTY.

The cross-cut on the property of the Montana Gold Mining & Milling Co., near Heron, intersected a stringer of ore when in 45 ft. When the contract of 100 ft. is completed drifts will be run on this and the main vein. Charles Sawdey is manager.

NEVADA.

ESMERALDA COUNTY.

The orebody opened by the raise from the 360-ft. level of the Golden Daisy lease has been followed for 80 ft.

The lessees are shipping 5 tons of ore per day that mills \$120 per ton. Chas. D. Wilkinson is manager.—The Cherokee lease on the Atlanta property is sinking to the 600-ft. level where cross-cuts will be driven to the vein. The shaft of the Nevada Eastern lease is in vein matter but no ore of commercial grade has been opened.—A holding company has been organized by the officials of the Goldfield Consolidated for the purpose of taking over and operating the Consolidated mill, the Combination mill, and the Consolidated company's railroad. The company is capitalized at \$400,000 and is to be known as the Goldfield Mining & Transportation Co. At the Clermont shaft of the Consolidated the ore recently opened at the 730-ft. level continues to run above an average of \$30 per ton. Cross-cuts are being driven from the 860 and 1000-ft. levels to open this orebody.—The aerial tramway from the Little Florence shaft to the mill is completed and the foundations and concrete floor of the mill are ready for the installation of the new machinery.—At the Red Top Extension lease on the Bull Dog fraction a cross-cut is being driven toward the vein from the 475-ft. level.—At the C. O. D. Victor cross-cuts are being driven east and west on the 450-ft. level.

HUMBOLDT COUNTY.

The Darby custom mill at Seven Troughs has just completed a run on ore from the Buckhorn mine and has started on a consignment from the Seven Troughs property.—The shaft at the Peter Pan is down 200 ft. and a cross-cut started toward the vein. Ralph O. Giddings is manager.

LINCOLN COUNTY.

W. L. Undike of Bay City, Mich., has secured a bond on the Finsen Ray mine in the Highland district and is preparing to install a 5-drill compressor and hoisting plant.—The installation of a 60-hp. Fairbanks, Morse & Co. gasoline engine and 5-drill compressor has just been completed at the X-Ray mine in the Highland district. A cross-cut adit is being driven to intersect the vein system of the country. This will give 250 ft. of backs.—Cross-cuts from the 800 and 850-ft. levels of the Menda mine have opened a 5-ft. orebody that assays 45% lead and 70 oz. silver per ton. The shaft is down over 900 ft. and a cross-cut started from that level to the vein. John R. Cook is manager.

LYON COUNTY.

John Chrisman, of Salt Lake, has bonded the Constantine Brothers and A. J. Matt property in the Yerington district for \$20,000. A 90-ft. adit has opened a vein of carbonate ore that averages 6% copper.

NYE COUNTY.

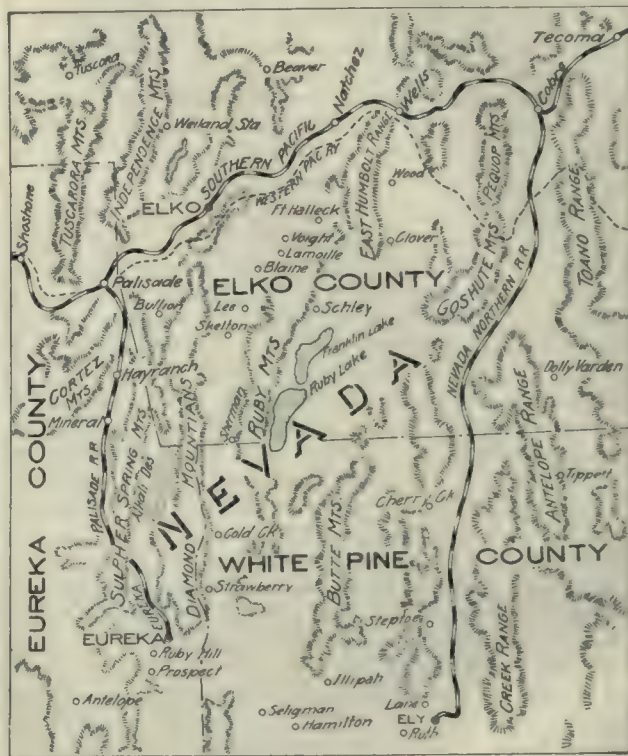
(Special Correspondence).—At the Bonnie Clare mill 10 stamps are dropping on ore from the Rattlesnake mine and the remaining 10 stamps will be placed in commission within a few weeks. The vein at the Rattlesnake varies from 2 to 7 ft. wide and assays about \$50 per ton gold, silver, and lead. Most of the ore is coming from the 100 and 200-ft. levels.—Considerable activity is reported from the Lida and Gold Mountain districts, and a number of producing properties are being developed.—The Nevada Johnnie Co. has secured a controlling interest in the Bullfrog group at Johnnie for \$25,000 and will commence activities at once. A 100-ft. shaft cut a vein assaying \$8 to \$30 gold per ton.—A small vein of high-grade ore was recently discovered on the Barrel claim of the Nevada-Johnnie mine. It is reported that a small mill will be erected soon.—The Crown Point Globe is producing approximately \$3000 per month, with a one-stamp mill in action.—What appears to be a third channel has been cut at the Fairview placer claims at Manhattan. This is regarded as one of the important discoveries made since the opening of the camp.—Quartz mining at Manhattan is active. Lessees are operating at the Consolidated, Big Chief, Liberty, War Eagle, April Fool, Big Pine, Black Jack, Union No. 9, and Wolfstone. At the Thanksgiving the shaft is going down to the 550-ft. level.—The Independence and Nemo are working on company account.

Rhyolite, August 10.

The 50-ton custom cyanide plant recently installed by W. M. Armstrong on lower Shoshone creek has made several successful runs on ores of that district.—The Mayflower Consolidated Mining Co. is installing 10 additional stamps in its mill in the Bullfrog district and will enlarge the cyanide plant to handle the increased output. A station is being cut on the 500-ft. level of the mine.—The Pioneer lease is shipping 40 tons per day of \$50 ore to the Goldfield mills.—The Clothier-Gingles lease shipped 20 tons of ore. The lessees are working on a 4-ft. vein, the larger portion of which assays \$100 per ton.—The Hobo lease is sacking two tons of ore per day and has arranged with the Crystal Bullfrog company to put the ore through the Crystal mill.

WHITE PINE COUNTY.

(Special Correspondence).—It is estimated that the July production of the Nevada Consolidated mines was 180,000 tons of ore. For two weeks a daily shipment of 100 cars was maintained.—A second drill-hole is going down at Ely Central, next to the Puritan claim of Cumberland Ely. Explorations are demonstrating an immense body of ore.—At the Coppermines a hole is being put down near the Ruth mine. The former hole cut 120 ft. of ore before it was lost.—The Boston Ely shaft has cut a body of



Map of Eastern Nevada.

commercial sulphide ore at a depth of 855 ft. A vein of gold-silver-lead ore running \$20 to \$70 per ton is also being developed.—The Ely Copper Co. has let a contract to sink its mill shaft from the 200 to the 500-ft. level.—The hoist will be moved from the old Golden Gate to the mill shaft and 2000 ft. of drifts will be run from the bottom.—The Hulse Co. is developing the Ontario vein in the Hidden Treasure with good results. Assays run about \$40 per ton in silver and lead. The parent company is endeavoring to arrange for the active development of the copper lodes below the contact.

Ely, August 11.

The Campbell group of 25 claims at Steptoe have been purchased by James A. Wood, of Kansas City. A mill-site of 40 acres and an excellent water right is included in the sale.—Thomas F. Cole, James A. Snedaker, G. F. Piper, and Joseph B. Cotton, directors of the Giroux Consolidated, have just completed an inspection of that property and are authority for the statement that a concentrating plant and smelter will be erected at some point in the Robinson district to handle the output from the mine. The recent drillings on the property have shown the orebody to lie

in such a position that it can be mined with steam shovels. —The monthly payroll at the Ely camp was approximately \$250,000.

OREGON.

BAKER COUNTY.

Free-milling ore is being opened at three points in the Double Eagle mine near Greenhorn. George Kelly is manager.—N. W. Chapman and E. W. Cummings have purchased the placer claims of W. H. Turner in Bump gulch.—W. B. Fisher, of Salt Lake, has bonded the McDougall group of copper claims near Homestead.—F. C. Moore is making a report on the Golden Chariot mine for the stockholders. The mine has been unwatered and thoroughly sampled.

JOSEPHINE COUNTY.

Some excellent ore is being opened at the Golden Wedge property in the Galice district.—A lower adit is being driven to cross-cut the vein on the Oriole mine.

MARION COUNTY.

In the Santiam mining district a number of properties have reported new orebodies. A 6-ft. vein has been cut at the Lewis and Clark mine.—The Mineral Harbor mines are adding new machinery to their equipment to handle the increased output.—The Electric Mining Co. has been improving its surface plant.—At the Black Eagle the company is cross-cutting for the vein.—The Free-land Consolidated Mining & Milling Co. is also cross-cutting.—The Gold Creek Mining & Milling Co. is developing 4 large veins on its property.—A new wagon-road is being graded from Elkhorn to the proposed smelter site on Gold creek, which is a central distributing point for the mines of this portion of the country.

UTAH.

BEAVER COUNTY.

The shaft of the Cupric mine is down 340 ft. and has opened several stringers of copper ore.—A cross-cut is being driven on the 500-ft. level of the Cedar-Talisman mine to cut the vein opened recently on the level above.

IRON COUNTY.

Plans are being drawn for a hydro-electric plant for the Gold Springs Mining & Power Co. at Modena. C. A. Short is president of the company.

JUAB COUNTY.

A 50-ft. cross-cut from the 1000-ft. level of the May Day shaft opened a body of silver-lead ore that is of shipping grade.—The Eureka City Mining Co. has been organized to develop the ground under the Eureka townsite. Walter W. Fitch is president and a working capital of \$100,000 has been subscribed.—The grading for the shaft and surface plant at the Bradley group in North Tintic is now completed and a wagon-road to the property is being constructed. M. F. Sammon is in charge of the work.—The new machinery for the Tintic Standard has been hauled to the mine and is ready for installation.—The Scranton mine in North Tintic is shipping 2 cars of zinc to the Kansas plants and 2 cars of lead to the Salt Lake smelters per week.—J. H. Webber has secured an option on the Copper Jack property in West Tintic and will install a Keystone drill to prospect the ground.

SALT LAKE COUNTY.

The Richfield Consolidated Mining Co. has been incorporated to develop four claims in the West Mountain mining district. Thomas H. Quillen, of Bingham, is president.—The stock of the International Petroleum & Development Co. was listed on the stock exchange in Salt Lake City. This is the first oil stock to be listed on the local exchange.—The United States Smelting, Mining & Refining Co. is installing an electrostatic separator to clean its concentrate of zinc.

TOOELE COUNTY.

The output of the Consolidated Mercur Gold mines for July approximated \$60,000. This is somewhat below the average output owing to a collapse of three cyanide tanks due to the ground settling.

UTAH COUNTY.

The Mineral Flat Mining Co., near American Fork, cut a vein averaging 18 in. wide and assaying 44% lead, 80 oz. silver, and \$2 gold per ton. This drift gives 200 ft. of backs and an adit has been commenced that will obtain additional depth.

WASHINGTON.

CHELAN COUNTY.

Ray P. Davis and C. V. McDowell have bonded the Blinn property in the Red Mountain district.

FERRY COUNTY.

(Special Correspondence).—The Republic Consolidated Gold Mining Co. held its annual stockholders' meeting at Republic, August 4.—The Quilp Gold Mining Co. has leased the Quilp mine, in Republic camp, to S. L. Boyer, for a term of three years, the lessee to operate the ground north of the adit.—The Rio Tinto-Treadwell Mining Co. has an adit in 50 ft. and has let a contract to extend it 400 ft. farther. The company owns 11 claims in Curlew mining district, situated 3½ miles southeast of Curlew, in the copper belt. The annual assessment work has been kept up for 7 or 8 years and \$5000 has now been raised for development.—The Pleasant View Mining & Milling Co. has been incorporated to develop a group of 5 claims on Kettle river. Chas. Lefevre, of Kellogg, is the chief owner.

Republic, August 10.

OKANOGAN COUNTY.

(Special Correspondence).—The mill at the Nighthawk mine is operating steadily and producing a considerable quantity of concentrate. Fifteen men are employed in the mine and mill.—A deal has been closed by which Charles Gerhard has sold to Charles H. Brooks, of New York, a group of claims on Palmer mountain, which he has had under development for ten years.

Republic, August 10.

STEVENS COUNTY.

Frank Davy has leased the Bonanza property near Bossburg and is cleaning out the old workings. A hoist and compressor will be installed on the property and a new shaft sunk to the ore on the 300-ft. level.—A. E. Swanson is at the Calumet & Hecla mine on Deep creek to superintend the preliminary operation of the 40-ton concentrator plant just completed.

SPOKANE COUNTY.

A meeting of the creditors of the Idaho Smelting & Refining Co. is to be held in Spokane August 15, when plans will be submitted for the reorganization of the company.—The lower adit at the Tungsten King mine at Deer Park cut the vein at a point giving 190 ft. of backs for a distance of 1000 ft. Arrangements are under way to install a concentrator at the mine.

CANADA.

BRITISH COLUMBIA.

The Snowshoe mine is now shipping between 600 and 700 tons of ore per day to the Trail smelter. The mine is being worked by a large open-cut, the overburden having been stripped by an electric shovel.

YUKON TERRITORY.

A 5-stamp mill is being hauled from Dawson to the Lone Star mine at the head of Victoria gulch. Lionel Gilchrist is in charge of the work.

MEXICO.

CHIHUAHUA.

Firman Smith has been examining the Quebradillas mine near Parral for the Tennessee stockholders of the Vita Colorada Mining & Smelting Co. Plans are under way for reorganizing the company and starting the mine.—The Cherokee Goldfields, Ltd., has completed a 10-ton mill at San Julian. Gerald Hopkins is manager.

DURANGO.

E. E. Payne is opening a 2-ft. vein near Vilardena that assays 4% copper and 200 oz. silver per ton.

Special Correspondence.

LONDON.

Tronoh Mines.—Wheal Kitty.—South Crofty.—De Lamar Company.

The history of the Tronoh Mines, Ltd., during the last couple of years has been one of disaster. The company owns tin-gravel deposits in the Straits Settlements, and organized in 1901. For six years things went right so far as the shareholders were concerned; the output was regular, and the dividends satisfactory. Shareholders received in all 160% in dividends. It appears to have been a case of rich deposits easily worked, that could not help yielding a profit. The original vendors and promoters, Foo Choo Choon and E. G. Edgar, were left practically in sole control. Expenses of mining and of local management were high, and the Board of Directors had to take most things on trust. Originally the offices of the company were in Cornwall, for many people there hold shares. In fact the Thomases and Pearces were well represented on the Board, and still are. Two years ago there were signs of the mine becoming difficult to operate. The underground workings presented trouble, probably because proper care had not been taken to keep them in place and to cope with the floods which are common there. One engineer resigned and his successor recommended a change to open-cut mining. Machinery was bought to tackle the new method, but almost before it arrived its uselessness was acknowledged. The ground showed signs of slipping in all directions, and neither open-cut nor underground working seemed practicable. Another change was made in the administration. Mr. Edgar resigned his managing directorship and has now left the board. Harry D. Griffiths was appointed engineer, and he has studied the situation for about nine months. The mine is still being worked, and is producing tin concentrate, but exactly how long it will continue to do so is a problem not yet solved. The Directors have called in R. J. Frecheville for advice, to help determine whether the mine will have to be abandoned or not. The company owns other tin-bearing lands which have not been fully tested, and it is hoped that these will form an asset to fall back on. During the year 1908 the tin concentrate produced amounted to 1712 tons, and sold for £123,683, while the working costs were £101,073. These costs are high for a gravel mine in the East, and are unwarranted. The Board of Directors, since assuming full responsibility, has found difficulty in straightening the financial arrangements between the company and the late controllers, a circumstance which often occurs when promoters are allowed their own way in the management.

One of the most interesting ventures in Cornish tin mining at present is the Wheal Kitty at St. Agnes. It is only a small mine, but it succeeds remarkably well. It has been worked for many years, and was re-opened three years ago by J. H. Collins, who remembered what high-grade tin ore had been found there. I have from time to time referred to the mine in these columns. The results of working during the first six months of the current year have fully maintained the reputation of the mine. The stamps treated 6028 tons, and produced 120 tons of concentrate, which sold for £9990. The average yield was 44½ lb. of concentrate per ton, and the average price obtained was £83 per ton. This is higher than was current in Cornwall during the period, and shows that the ore is particularly pure. A profit of £2600 was made, and £912 was paid as dividend, which was at the rate of 7½% per annum on the issued capital. During the half year £3300 additional capital was subscribed for the purpose of extending the dressing plant and providing a new pump.

The South Crofty mine at Camborne, Cornwall, has issued a preliminary report for the first six months of the year. The figures are not fully audited, but are practically correct. The Directors believe in the issue of early information, as soon as the main items have been ascertained. During this period 29,152 tons of ore were milled, and the produce was 335 tons of tin concentrate, 72 tons of wolfram

concentrate, and some arsenic. The sales realized £34,056, and the working profit is given as £6187. The Directors estimate establishment-charges and other incidental expenses at £1000, and announce a net profit of £5187. All development charges during the six months have been included in the costs, though nothing is said about writing off past development and shaft sinking accounts or depreciation of machinery. Some of the English papers question the propriety of my criticisms when dealing with the announcements of this company. I pointed out that no provision for depreciation or writing off development amount was made, and that the small balance of working profit was not sufficient to show that the mine was on a paying basis. The margin of profit is much higher now, and has shown a gradual increase month by month, so it is safe to say that the mine has reached a paying stage.

The De Lamar company, operating in Idaho, has once more become a dividend payer. The old company paid £500,000 dividends on a capital of £400,000 within the years 1891 to 1901. Then it was decided to write down the capital to £80,000, as the mine had for some time shown signs of exhaustion. From 1901 to 1905 dividends totaling 87½% on the reduced capital were paid. After that came three lean years, when expenses were hardly met. The shareholders are therefore fortunate in having received a 10% dividend for the year ended March 31. During the 12 months in question, 42,116 dry tons yielded 15,825 oz. gold and 236,470 oz. silver. The costs of treatment have been greatly reduced during the year, being now \$9.41, as compared with \$11.47 a year ago. Some difficulty has recently occurred in connection with the silver sulphides at the lower levels, due to the presence of antimony. The engineer reports that no estimate can be given as to the life of the mine, but points to the continued discoveries of ore in all parts, a fact which gives him reason to believe that the mine will last for a considerable period.

WASHINGTON.

Tariff Revision.—Mineral and Metal Schedules.—Coal-Land Titles Annulled.—Tawney on Conservation.—Excavation at Panama.

William H. Taft is the man of the hour in Washington. For a time it looked as if Orville Wright, the aviator, was to have the spectacular arena all to himself, with his wonderful aeroplane, but Taft has triumphed! Wright won fame by going up into the air; Taft has won by refusing to go into the air. The sudden right about face of Congress on the tariff question to coincide with the views of Mr. Taft for a downward revision is the sensation of the city. When the Senate compelled the House to bow the knee in legislative matters, and the duties went up, up, higher than any aeroplane, Washington thought they would remain there. The men who write for Democratic papers were filling the columns with what the Democrats would do to the Republicans in the next election. But Mr. Taft has taken the tariff bill, schedule by schedule, and has informed the conferees just what is meant by downward revision in each instance. Reductions have been numerous.

Iron ore from 40 to 15c. per ton. Pig iron, kentledge, and spiegeleisen, from \$4 to \$2.50 per ton. Scrap iron and steel from \$4 to \$1 per ton. Aluminum, in crude form, from 8 to 7c. per pound; in plates, from 13 to 11c. per pound. Monzonite sand and thorite, from 6 to 4c. per pound. Lead acetate white, from 3½ to 3c. per pound; brown, gray or yellow, from 2½ to 2c. per pound. Nitrate of lead from 2½ to 2¼c.; litharge, from 2¾ to 2½c. per pound. Bituminous coal from 67c. per ton to 45c. Petroleum is placed on the free list. Boracic acid from 5 to 3c. per pound. Chromic acid from 3 to 2c. per pound; borax, from 5 to 2c. per pound; copperas, now dutiable at ¼c. per pound, is reduced to ⅓c.; sulphite of ammonia, now dutiable at ⅓c. per pound, is transferred to the free list. Sulphuric ethers are reduced from 40 to 8c. per pound; ochre and ochery earths, sienna and sienna earths, and umber and umber earths, from 1½ to 1c. per pound; orange mineral from 3¾ to 3¼c. per pound; red lead, from 2¾ to 2½c. per pound; white lead, white paint, and pigment containing

lead, from 2½ to 2½c. per pound; sulphur, refined or sublimed, or flowers of, from \$8 to \$6 per ton; plaster rock or gypsum, crude, from 50 to 30c. per ton; if ground or calcined, from \$2.25 to \$1.25 per ton; mica, cut or trimmed, from 12c. per pound and 20% ad valorem; and unmanufactured, from 6c. per pound and 20% ad valorem; all to 30% ad valorem, except mica plates or built-up mica, which are 35% ad valorem.

The increases were as follows: Chrome metal, ferrous-silicon, tungsten, and other new metals used in the manufactures, from 6c. per pound and 20% ad valorem; all to exceeding 15% ad valorem. Tungsten ore was made dutiable at 10%; a duty of 1c. per pound was put on zinc in the ore where it contains more than 20% of zinc. On zinc with less than 20% there is a lower rate. Oxalic acid is taken from the free list and a duty of 2c. per pound put on.

Attorney General Wickersham has discontinued the equity suits begun some time ago against the Utah Fuel Co. to annul title to 800 acres of coal lands in Utah valued at \$40,000. The discontinuance is made in view of the settlement between the Government and the representatives of the Fuel company under which the company agrees to pay the Government \$73,000, re-conveys the 800 acres to the United States, besides forfeiting \$14,400 paid in when patents were issued. The formal announcement of the discontinuance of the suits was made in the following official statement issued at the Department of Justice: "A few months ago, the Utah Fuel Co., a subsidiary corporation of the Denver & Rio Grande Railroad Co., pleaded guilty in the District Court of the United States for the district of Utah to an indictment charging it with having conspired to defraud the United States of 1440 acres of coal lands, and was fined \$8000. It also re-conveyed to the United States these lands, which are appraised at upward of \$50,000, and forfeited the original purchase price, and paid to the United States the sum of \$192,000 in settlement of its claims for coal taken from other lands which could not be re-conveyed owing to the fact that they were mortgaged to secure issues of bonds outstanding in the hands of bona fide purchasers. Subsequent to such settlement the agents of the Government became satisfied that the Utah Fuel Co. had illegally acquired title to other coal lands of the United States in Utah, and after examination of their report the Attorney General directed that suits in equity be brought to annul titles to such lands. Shortly after the commencement of these suits the representatives of the company opened negotiations for settlement, which resulted in an adjustment agreed to by the Attorney General and the Secretary of the Interior, pursuant to which the Utah Fuel Co. pays to the Government the sum of \$73,000, re-conveys to the United States 800 acres of coal lands now appraised at a value of about \$40,000, besides forfeiting the sum of \$14,400 paid to the Government at the time the patents were issued upon the lands. In view of this settlement, and upon payment and re-conveyance as above mentioned, the Attorney General has discontinued the suits. Only the lands described in the suits discontinued were embraced in the settlement. Further investigations are being made, and in case other land shall appear to have been illegally acquired, suits will be instituted at once to assert the Government's interest therein."

James A. Tawney, member of Congress from Winona, Minnesota, and chairman of the House Committee on Appropriations, made a vigorous defense of the attitude of Congress toward the conservation movement on the floor of the House the other day. He made the declaration that the national legislative body was being continually misrepresented in certain newspapers and magazines. "The most unjustifiable and reckless criticism of Congress upon this subject recently appeared in the *World's Work*, in an article written by Dr. Charles Richard Van Hise, president of the State University of Wisconsin," said Mr. Tawney. "Dr. Van Hise is now, and for several years has been, president of the University of Wisconsin. He has also served for many years as a member of the faculty of that institution, and was also a member of the Conservation Commission. This, however, has not been his only occupation, or his only source or revenue. For more than 26 years, or from 1882

until March of this year, he was an employee of the Geological Survey of the United States, and during that time drew from appropriations made by Congress as compensation for his services in the aggregate about \$50,000. Dr. Van Hise in this article assumes and falsely charges that the attitude of Congress has been one of hostility toward this movement, and invokes 'public condemnation' upon myself for having proposed the amendment to the Sundry Civil Bill in the last session of Congress which has made it impossible for any officers of the Government to pay any money from any appropriation to defray the expense of any commission not authorized by law." Mr. Tawney then went on to state that he had prepared an article for the *World's Work* in reply to that of Dr. Van Hise. The editors of that magazine refused to print his communication, making the statement that they did not think it would be good editorial policy. Mr. Tawney then asked that his article be inserted in the Congressional Record, which was done. In his reply, Mr. Tawney enumerates the appropriations given for the Department of Agriculture, the Forest Service, and the Geological Survey, and says that all these were for the conservation of the natural resources of the Government.

The War Department announces the total excavation of The Panama Canal to date as 78,905,501 cu. yd. There yet remain to be excavated 95,761,094 cubic yards.

MEXICO.

Zinc Barred by Tariff. — European Market for Zinc Ores. — Freight Rates. — Railroads in Western Chihuahua.

It is understood that shippers of zinc ore from Mexico to the United States will have until August 10 in which to get their shipments across the border, and there has been great 'greasing of the wheels' at the railroad offices, at the Federal assay offices, and elsewhere to get clearance papers made out and the cars away. Should the new rates go on as expected, it will certainly kill zinc shipments to the United States, at least for the present. The sliding-scale of the new tariff is but a miserable sop at the best, and it would have been far more agreeable to have had a flat rate of 1c. per pound duty instead of such an uncertain schedule, for ores under 25% zinc will not pay to ship from Mexico to the United States anyway. It is not believed that Mexico will suffer greatly, as there are almost as many buyers in the market for shipment to Europe as there were before for the United States. L. Vogelstein & Co. are now in the market as agents for Aron Hirsch & Sohn, Germany, instead of for the American Zinc, Lead & Smelting Co., as before; the Metallgesellschaft and the Compañía de Minerales y Metales will simply divert to their European representatives instead of shipping to the American Metal Co., as formerly. R. O. Ihlseng is also actively in the field, as well as others too numerous to mention. The object of Mr. Ihlseng's activity in the recent zinc discussion in the United States is now made evident. Among all the agitators for a zinc-duty in the new tariff-law none were more urgent and insistent than R. O. Ihlseng, who organized many of the zinc-duty clubs in Missouri, and, being a miner in a small way in the Joplin field, and a more than casual visitor to Mexico, his talks carried considerable weight, notwithstanding the fact that he had previously favored shipment abroad, and had always been a small buyer of zinc ores in the States for that purpose. As soon as the zinc-schedule of the Aldrich bill was decided upon, I understand that there was not one of even the smallest shippers of zinc ores in Mexico who failed to receive a letter from Mr. Ihlseng bidding on the ores for shipment to Europe. As yet the prices are far from being as favorable for shipments to Europe as they were to the United States, because of a somewhat higher freight rate. From Chihuahua, one of the principal shipping points, it is \$9.72 per metric ton to ship-side at Tampico, and 13s., or \$6.50, from there to Europe, making a total of \$16.22, while to the United States they paid \$3.78 to El Paso, and thence \$4.23, or \$8.46, to Kansas and Missouri points, a total of \$12.24. But it is hoped this may be adjusted between the

railroads and the steamship companies. Monterey, being nearer Tampico, has not this difference against it, though I have not the figures at hand. Undoubtedly the freight rates favor European points. The more optimistic are of the opinion that the duty on zinc will raise the price of the metal to that extent in the United States, and that shipment there may be resumed as before in the not distant future. The quicker liquidations and returns make it a more favorable market than the European.

Reports from New York are to the effect that F. S. Pearson has obtained for the Mexican Northwestern Railway of Canada, the Rio Grande, Sierra Madre & Pacific railroad, running from Juarez, Chihuahua (across the river from El Paso, Texas), down to Nuevas Casas Grandes, Chihuahua, a distance of 160 miles southwest from El Paso. It will be remembered that Pearson's company recently acquired control of the Chihuahua & Pacific railroad, running west and north from Chihuahua a distance of 180 miles, and soon afterward the Sierra Madre & Pacific running from the Chihuahua & Pacific northwestern terminus to Madera, about 40 miles farther, and toward Nuevas Casas Grandes, the terminus of the latest acquisition. As there remains a stretch of 115 miles to connect the two roads from Madera to Nuevas Casas Grandes, and thus give the company a through line from Chihuahua to El Paso, as well as an outlet through El Paso for the timber from the same 3,000,000 acres of pine-land, purchased when the Sierra Madre & Pacific railroad was bought, it is believed there will be no long delay in completing said connection. The plans of this Mexican Northwestern railroad are said to also include a connection finally to the west coast in either Sinaloa or Sonora. The company's movements are closely watched by all who are interested in the development of the western part of Chihuahua.

GUADALAJARA, MEXICO.

Hydro-Electric Plants.—Iron and Steel Industry. — Developments in Tepic.—Guanajuato Power & Electric Co —Lupita Mines.

The Chapala Hydro-Electric & Irrigation Co., which will transmit power generated on the Santiago river to the mining districts of Jalisco, Zacatecas, and Aguascalientes, has been launched with a capital of \$14,000,000. Fernando Pimentel, of Mexico City, is president. The company takes over the two plants that supply Guadalajara, and a 12,000-hp. plant under construction. It is estimated that under its concessions the company can develop fully 100,000 hp. Surveys for the transmission line which will carry current to the Etzatlan and Hostotipaquillo districts of Jalisco have been completed, and the work of erecting towers will be commenced immediately. The Tula iron mines in the Tapalpa district of Jalisco, together with 125,000 acres of land, and over 1,000,000,000 ft. of timber, have been sold to Massachusetts men represented by J. W. Dickinson, of Boston, for \$1,000,000. The Mexico Iron & Steel Co., capital \$5,000,000, will be organized to work the mines and build a modern steel plant and implement factory. The company will be headed by George H. Morrill, of Norwood, Massachusetts, and it is stated the investments will total \$1,000,000. The Tula mines have been worked at intervals for more than a century, and the iron is held to be the equal of the Norwegian product. The properties had been owned by Mexicans. The 150-ton plant of the Virginia & Mexico Mine & Smelter Corporation has been placed in commission. It is the first modern reduction plant in the Hostotipaquillo district of Jalisco. The company owns the Cabrera, Peralta, and America mines, and has an abundance of ore ready for the mill. The Mina Grande, a famous *antigua* of the Hostotipaquillo district, has been sold by the Dwight Furness Co. of Guanajuato to French interests, represented by Luis Chevrillon, of Mexico City. A company will be formed with French capital to re-open the old mine and develop it extensively. An adit that will cut the veins below the old workings is planned. The price of the property was \$75,000.

The Verdiana mine in the Ameca district of Jalisco has been bonded to James Moffitt, of Oakland, California, in the sum of \$25,000. Mr. Moffitt will start development work at

the close of the present rainy season. W. R. Tucker, of Guadalajara, owns the mine, which is a gold-copper property.

The mining districts of Tepic will not secure transportation facilities quite as soon as expected, as the work on the Southern Pacific extension has been suspended until after the rainy season. The forces had reached a point within 22 miles of Santiago Ixcuintla, where the Santiago river will be crossed, when the order for suspension was received. Rains have been heavy in that part of Mexico, and it was impossible to make satisfactory progress. Construction will be resumed in October or November on an extensive scale. Track is now being laid out of Tequila, the present terminus of the Southern Pacific line in Jalisco, and it will be continued to La Quemada, a point 20 miles northwest, which is near the place where the extension will enter the *barrancas* of the Sierra Madre. Train service will be extended to La Quemada in October, and transportation facilities will be then much nearer the mines of the Hostotipaquillo district. Waldo G. Meyers, a Mississippi man, who is developing the Zapote mine at El Liso, Tepic, will put in a stamp-mill, concentrators, and a cyanide plant and operate the machinery by water-power. The mine is a Spanish *antigua*, and an adit is being driven to cut the veins. The ores contain silver and gold. The El Dorado Mining Co. of Mexico City, which owns several properties in the Amatlan de Cañas district of Tepic, is making tests with a view to the erection of a smelter. The Brady mining interests of Goldfield, Nevada, will develop tin deposits on the Manuel Ruiz ranch in the Guanajuato district of Guanajuato. The ranch was recently sold to F. A. Cody, of Saratoga, California, and the Brady interests are concerned in the deal. The tin deposits have been worked by natives in a desultory way for many years. The 60-ton reduction plant of the Carmen Gold Mining Co. in the Guanajuato district is nearing completion and will be placed in commission early in September. The Carmen company is controlled by the Guanajuato Consolidated Mining & Milling Co. Within three months the Guanajuato Power & Electric Co., which made possible the mining revival in the old Guanajuato district, will commence work on a third hydro-electric plant. The company's first plant, an 8000-hp. installation on the Duero river near Zamora, Michoacán, was opened in October 1903, and last year a second plant, capacity 3000 hp., was built on the Angulo river in Michoacán. The third plant will be also on the Angulo river and will have a capacity of 10,000 hp. The company's power service is being steadily extended, and handsome dividends are being paid. Colorado men are principally interested in the company. The Lupita Mines Co. of Colorado Springs has resumed work in the Lupita mines in the Mascota district of Jalisco, after a suspension of more than two years. Hoisting and drilling machinery has been purchased and development work will be pushed. For several years the Lupita mines paid good dividends. Operations were stopped pending the acquisition of adjoining mineral ground, and this was secured some time ago. H. M. Sunde and relatives are clearing about \$3000 per month on shipments of high-grade ore from the San José de las Agujas mine in the Navidad camp of the Mascota district of Jalisco. This mine has been producing for several years, and some of the richest ore found in this portion of Mexico has been taken out of it.

BUTTE, MONTANA.

Butte Coalition.—Granite Mountain Sold.—Litigation Threatened.—Heinze and the Davis-Daly.—Smelter for Corbin.

The Butte Coalition Mining Co. will almost double its production of ore this year. Minnie Healy ground has proved very rich, and the Tramway has developed some valuable veins. The output of copper in 1909 should be between 30,000,000 and 35,000,000 lb. The company is getting out for reduction more than 1500 tons of ore per day. It is stated by a miner in position to know that development has been increasing the ore reserves greatly. There is a rich vein on the 1700-ft. level, which was recently opened, and some other veins have been cut by a drift which is headed for Minnie Healy ground. The latter claim is to be

opened on this level, a part of the extensive development carried on for a long period by the management with vigor and gratifying results. Although operations in the upper levels of the Minnie Healy are hampered by the fire, the management has planned a big campaign of ore-development and extraction for the ground below the 1500-ft. level.

It has been admitted that the North Butte company has bought the Granite Mountain claim. The fact was known here and asserted while being denied in the East. The company is still raising from several levels to connect with the bottom of the shaft on the Granite Mountain, which is 500 ft. below the surface. This will provide another working shaft. With connections with the Badger State shaft, a Boston & Montana company's claim near the North Butte company's property, it will be in a situation favoring extensive development and extraction. Although the Granite Mountain vein was of no importance on the levels opened by the North Butte company in the property since its purchase, when the shaft connections are made, the claim will be of value in the operation of the mine. In the Granite Mountain the Lewisohns, the former owners who sunk the shaft, and recently sold it to the North Butte company because they find nothing, evidently put their money on the wrong card, while they missed a good thing in selling the Edith May, whose orebodies have been rich and extensive.

There is talk of a controversy between James A. Murray and some of the Amalgamated companies over orebodies, including the claims of the North Butte company and those of the Bell mine. Murray owns the Ticon claim, lying in the midst of the North Butte company's claims and not far from the Bell, and miners to whom he has given a lease have sunk a shaft to the 800-ft. level, where they are driving eastward on the vein in the Ticon. Murray's contention is that this vein enters the Speculator claim on the dip, and that the North Butte company is taking his ore, instead of mining from the Edith May vein; in other words, that the Edith May vein, mined at low levels in the Speculator, apexes in the Ticon and not in the Edith May, northward of the Ticon. East of the Ticon is a claim belonging to the North Butte, and if Murray should be right, part of the vein would apex in this property and belong to the North Butte company. Murray may have some difficulty in showing that he is entitled to the ore in the Edith May, although his lessees are driving eastward for the purpose of discovering whether the workings of other companies are upon the Ticon vein.

The rumors concerning F. A. Heinze and the Davis-Daly estates have received a new turn by the statement that Heinze refuses to sell his interests in the stock because he objects to making a retreat while the charges against him in New York are unsettled. It is said that Heinze would withdraw from the Davis-Daly if he were not under a shadow, but there are people here who do not believe he would withdraw under any circumstances. Heinze has always been pugnacious and obstinate, and he probably would stick to his stock in the Davis-Daly at all hazards.

One of the managers of the Amalgamated mines states that the fire in the Anaconda is dormant at present, and that it has not given any trouble for about two months. It has been closed by bulk-heads, and the official said that it would give no concern till it should force its way out by an eruption of gas somewhere in the future. That is an event to be expected in the due course of time.

The Badger State shaft is now down 1300 ft. It is being sunk at the rate of 100 ft. per month, and will be carried to lower levels. The ore in the Corbin district is causing definite talk about a smelter for the district. Extensive mining has been done there for some time, and the widening activities of the camp, and the increasing developments of good veins and orebodies will make a smelter a necessity before long. Something that will stimulate operations in the Corbin country will be the electrification of the mines. This will take place soon. The Boston & Corbin company is mining three claims in the district, and it expects to secure electricity from the dams near Helena early in the fall, and then will run all its machinery with electric power. The Boston & Corbin is working three claims with a shaft 500 ft. deep, and most of its workings are in ore, while the

mineralization of the veins increases with depth. News from Corbin is of an encouraging kind, and all the owners believe it will become a big camp. Butte people hear that Phelps, Dodge Co. is about to retire from the mining field, and that the Cole-Ryan people will acquire its holdings in the Southwest.

TORONTO, CANADA.

Discoveries on Gillies Timber Limit —Provincial Mine —Cobalt Shipments.—Cement Merger.—Coal Miners Strike, Glace Bay.

The Gillies Timber Limit area is making good. One energetic private operator in the course of a few weeks has done what the officials of the Ontario Government with all the resources at their command, have failed to accomplish in three years. He has proved by actual operations that the deposits are immensely valuable. The successful miner is J. H. Waldman, of Montreal, who has made what is regarded as the most important find of the year on a property comprising about 92 acres, secured for a few thousand dollars, situated to the south of the Provincial mine. He set to work energetically a few weeks ago, employing a force of 70 men in trenching, the result being the discovery of what it is now the fashion to speak of as a 'silver sidewalk'. The vein has been stripped for a considerable distance, and is found to contain rich ore varying from 2 to 8 in. wide, extending from the Waldman property into the adjoining holding owned by M. J. O'Brien, where it has been found to widen considerably. This location of 40 acres was purchased by Mr. O'Brien a few weeks ago for \$10,500, and the selling price is now put at \$500,000. It will be known as the Young & O'Brien mine. The Waldman will be developed with all possible speed, the engineer in charge being Charles A. O'Connell, who has had a considerable Californian experience. Naturally this discovery, so soon after the sale of many Gillies Limit properties at prices that now appear ridiculously low, has created widespread interest and has greatly stimulated the activity of other purchasers. A feature of much significance is that the Waldman find is in the Keewatin formation, which has generally been neglected hitherto. A 60-in. vein, carrying 4500 oz. silver per ton, has also been struck in the same formation near shaft No. 54 on the Nipissing property.

The Provincial Government has decided to sell the Provincial mine after all, which, considering that they have been making a bluff at operating it for three years without any results of a character regarded as suitable for publication, is probably the best thing they can do. There have been repeated rumors that such a deal was in contemplation, but they have always been met with strong denials in official quarters. Premier Whitney has emphatically pledged himself, as a sop to the vigorous 'public ownership' sentiment of the Province, that the mine would be retained and worked as a public undertaking for the sake of revenue, but these pledges have now gone by the board. In fact, it almost appears, in view of the recent discoveries, as if the slackness with which operation at the mine has been conducted, had been intended to influence public opinion in favor of getting rid of a white elephant. At all events the loudly vaunted Government policy of running a mine in the public interest is a thing of the past, and the Provincial mine, covering an area of 30 acres, together with 20 other lots on the limit, amounting to about 350 acres, are offered under competitive tenders to close September 13, subject to a royalty of 10% on the output. Deputy Minister Thomas W. Gibson, of the Mines Department, has in preparation an official prospectus which will show the present condition of the mine and the result so far obtained.

The shipments for July from Cobalt amounted to 2715 tons, as against 3323 tons in June. The Crown Reserve held the first place as regards value, sending out seven cars of high-grade, two of medium, and two of low, while the La Rose was easily first, with three cars of high-grade ore, and 13 of low. There was a general slackening in both tonnage and value. Total shipments for the seven months ending with July were 18,006 tons, as compared with 25,361 tons for the whole of 1908.

Algernon P. Seymour has been appointed superintendent

of the Cobalt Lake Mining Co., the position being made vacant by the recent untimely death of E. L. Fraleck. A vein of 2½ in. on this property, discovered originally on the 130-ft. level, has widened at the 190-ft. level to 6 in., and the silver content increased to 3000 oz. per ton. The Silver Cliff joined the ranks of the shippers last week, with two cars of second-grade, which will be followed by a car of high-grade. A 100-ton concentrator will shortly be installed. The Foster mine, which has been doing poorly for some time, owing to the pinching out of the good ore, is to the front again, having struck 4 in. of rich ore between the old shaft and the Lawson line. The Ophir has obtained 4500 oz. ore at the 83-ft. level, the vein being in the Keewatin, and 3 in. wide. The directors of the Bailey have ordered the first half of a 12-drill compressor to be electrically driven by a 100-hp. motor. The Green-Meehan is another company which, after having run out of ore and become a non-producer for a long time is getting its second wind. Steady development has been rewarded by the recovery in a winze sunk 15 ft. from the 100-ft. level of the high-grade vein from which the first shipments were made.

The cement industry has for some time been in a bad way owing to over-production and undue competition, and the usual remedy of consolidation is being resorted to. Negotiations are on foot for a merger embracing the leading plants in Canada, with a proposed capitalization of \$25,000,000. While the highest rate of annual consumption amounts to 3,195,498 bbl., the producing capacity of the Canadian plants is over 10,040,420 bbl., having increased enormously during 1908. Though no definite arrangement has so far been made, it is regarded as certain that a merger will be effected, if not at present, in the near future.

The strike of the miners of the Dominion Coal Co., at Glace Bay, which has been in progress for more than a month, shows no signs of termination. Both sides continue firm, and while the company is slowly increasing its working forces, the defections from the ranks of the strikers have been comparatively few. The company has been able to make a good showing of shipments by drawing largely on the coal from the banks. The output for July was 203,982 tons, of which 136,000 was taken from the mine, the banks supplying the rest. The strike is likely to extend to the members of the United Mine Workers employed in the Spring Hill collieries, and by the Nova Scotia Steel & Coal Co. at Sidney. Resort was had in the latter cases to the Department of Labor and Conciliation Boards appointed under the Lemieux Act. But their findings were not satisfactory to the men, as in both cases they decided that the employers were justified in refusing to recognize the union on the ground that it was practically a 'foreign' organization, having its headquarters in the United States. As the great majority of organized workmen in Canada belong to international bodies, the far-reaching and significant character of these decisions can be realized. If all unions affiliated with international bodies are put out of court, any usefulness which the Lemieux Act may or could have had for the settlement of labor troubles is at an end.

ROSSLAND, BRITISH COLUMBIA.

Centre Star. — Federal Mining & Smelting Co. — Poplar Creek.

The mining situation at the Centre Star group of the Consolidated company is as bright now as it has been for some time. Big orebodies are being found at all parts of the property, the value of most of the ore being up to the average or better. A 14-ft. vein has been found on the sixth level of the Centre Star; the main vein on the War Eagle, as opened on the 500-ft. level, shows a large tonnage of \$16 to \$22 ore; a new vein of \$14 ore has been opened on the eighth level of the War Eagle, and two of the important Centre Star veins have now been found at 500 ft. in the Iron Mask and Idaho claims. The operations of this group earn from \$35,000 to \$43,000 per month for the Consolidated company. At the Trail smelter, owned by the Consolidated, a new copper furnace was blown in last week. This gives the plant four large modern copper furnaces and a big lead stack, or a capacity of approximately 2000 tons per day. The lead furnace has just been

fitted with a mechanical feed, which is a great time and labor-saver. This furnace treated 250 tons of lead ore one day last week, producing nearly 130 tons of bullion. The capacity of the lead and silver refinery is over 100 tons per day of the former metal, and it is the intention to make further additions without delay, as conditions locally point to heavy shipments from near-by mines from this time forward.

At the annual meeting of the Cambrian Mining Co. it was decided to place a further block of treasury stock to realize funds with which the steel-concrete shaft, being sunk in Moyie lake, will be put down to bedrock. This concern anticipates cutting the famous St. Eugene lead under the waters of Moyie lake. The undertaking has not proved an easy one thus far. A subsidiary company to the Federal Mining & Smelting Co., the Fort Steel Mining & Smelting Co., bought the mine, smelter, and equipment of the Sullivan Group Mining Co. at sheriff's sale. The Federal Co. held bonds in the Sullivan Group Mining Co. to the extent of about \$225,000. The outstanding indebtedness of the defunct company will be taken care of by the purchasers with a special stock issue, subject to recall at par. The smelter has been valued at over \$400,000, and there are 150,000 tons of ore in the mine that will average 15% lead and 6½ oz. silver. The Hattie Brown mine in the South Belt broke into the shipping list last week, sending a 30-ton car of select ore to the Trail smelter. The work of sinking the main shaft on the Le Roi No. 2, Ltd., goes on steadily; it is now down 100 ft. below the 900-ft. station. The new orebody on the 400-ft. level is proving good.

Considerable work is being done in the Poplar Creek district. The Gold Dust, Silver Bubble, Mayflower, Morning Group, Champagne, Marquis & Gilbert, and Golden Crest are among the claims on which work is now being done.

A lot of surface work is being done at the Snowshoe mine of the Consolidated Co. The ore deposits are being stripped preparatory to some 'glory-hole' operations. It is likely that shipments will be increased from this mine, now that the company has put another furnace in operation at Trail.

PIOCHE, NEVADA.

Las Vegas Smelter. — Salt Lake R. R. Troubles — Prince Con. Spur. — Nevada Utah. — Atlanta, the New Gold Camp.

Conditions in this camp are decidedly healthy, and the outlook highly promising. The Nevada Utah Mines & Smelters Corporation ran its product from the Day mine up to 200 tons per day, but have lately dropped to about 100 tons daily. The reason alleged for the decrease, and probably the true one, has been the rapacity of the smelters. The ore is exceedingly desirable for smelting purposes, but carries small amounts of silver. The large excess of iron and manganese in the ore is almost sufficient to cover transportation costs. The smelter refuses to pay for lead under 5%, although doubtless the amount of this metal recovered, if paid for, would cover mining costs. The officials of the Nevada Utah Co. have been so incensed at the treatment accorded them by the smelters that their Western manager was recently called to the company's office in New York for consultation. Upon his return he gave out for publication the statement that the money had been raised to erect an independent smelter near Pioche, which will purchase custom ores and furnish the desired relief. In this agitation for relief from smelter extortion W. A. Clark has taken a deep interest. As the builder of the S. P., L. A. & S. L. railroad, he has long desired to see a smelter built which would stimulate mining and augment traffic on his railroad. He has taken a special interest in Las Vegas, a logical place for a smelter, situated at the junction of the Las Vegas & Tonopah railroad with the Salt Lake line. Mr. Clark built the L. V. & T. railroad with his private funds, as a feeder to the Salt Lake line. Thus far it has been a financial failure. The Tonopah & Tidewater railroad, backed by A., T. & S. F. interests, made a shorter line to Los Angeles and took the business.

Mr. Clark, being a man of great force, wealthy, and hav-

ing been successful in the mining and smelting field, has been much disappointed at the lack of success of his railroad venture thus far. The first year after the Salt Lake line was built it was nearly destroyed by floods and was out of commission for several weeks. The following year it was washed out a second time. Again repaired and reopened, the floods once more descended and wrecked the road for a distance of nearly one hundred miles. The other disasters had been serious; this was appalling. It took two months of time to re-open the line, and is said to have drawn upon Clark's bank account to the extent of \$2,000,000. This hundred miles of road was re-built to defy the wrath of Jupiter Pluvius. Now Mr. Clark naturally wishes to see it a financial success. In the bitter controversy over location which occurred when the line was built Mr. Clark was outwitted by Mr. Harriman. The railroad novice proved no match for the veteran railroad man and financial manipulator. When the battle was over and the smoke cleared away, it was found that the Harriman interests held 51% of the stock, while to the Clark faction had been conceded the management for the first ten years. W. H. Bancroft, vice-president and general manager of the Oregon Short Line, and Harriman's right bower at Salt Lake, was first vice-president. It is said that the arrangement provided that the auditor and certain other officials should be selected by Mr. Bancroft. F. A. Wann, Clark's traffic manager, is an able man, and has tried hard to make the best of the situation, but it has been freely gossiped in railroad circles that the Harriman interests were trying to checkmate Clark at every turn and to make the Salt Lake line so unremunerative that he would become discouraged and let go. The ex-Senator, however, isn't built that way, and proposes to fight it out. He sees that the Gould system, from which he has derived most of his through freight traffic, is about to open a through line of its own to the coast, over which it can handle all the freight formerly turned over to the Salt Lake line. The only hope of making the Salt Lake line a pecuniary success lies in developing the local resources of the country through which it passes. Hence Clark's deep interest in the smelter situation. His mining engineer, E. W. Clark, of Ophir, Utah, has just spent a week investigating the ore situation and the prospects for a smelter somewhere on the Salt Lake line. W. A. Clark himself, recently returned from Paris, is now in Butte. A little later he is to come down to this district and personally grapple with the problem of how to make more business for his railroad. Meanwhile a line has been surveyed and tentatively located, connecting Pioche with some of its outlying mines and terminating at the Prince mine. This property, owned by the Prince Consolidated Mining & Smelting Co., has been shipping a little of its fluxing ores to the smelters for a test, and has sent out some sample cars of its better grade ores, but the waste of wagon transportation is too great and a railroad is to be built. The same lack of railroad sense which permitted Mr. Clark to be scooped by the Santa Fe has been manifested in the hesitation over building this line to the mines and the haggling over how much money should be contributed by the Prince Consolidated to pay for it, the amount thus advanced to be reimbursed in freight charges. The cost to the railroad company will be the same in the end, but the development of the region has been deferred, and the traffic which might have been created has been forever lost. Meanwhile the ten years tenure of office of the Clark officials is rapidly slipping away.

Unquestionably reliable reports from New York indicate that negotiations have been resumed for the settlement of the differences between the Nevada Utah and the Ohio Kentucky and the forming of a new company to re-open the old hill which was the scene of so much activity here in the early seventies. The Nevada Utah has begun to drive an adit from its ninth level toward its old Hillside mine, which was such a heavy producer during the seventies and eighties. This adit will be extended to connect with the workings of the Bristol Consolidated, and will be a vitally important factor in the ore production of that district. By the time it reaches the Hillside the Nevada Utah should be a heavy shipper over its narrow-gauge railroad. The Mendha continues to ship about a car a week, and lessees at the Bristol

Consolidated are still sending out an occasional car. The Pioche Metals Co. has joined the list of shippers and sent out a car from its Point mines. The Boston & Pioche has closed down, its president, A. W. Scott, giving out the statement that heavier machinery is to be installed and the shaft sunk to the water-level immediately. The Highland Mary mine, in the Highland district, has recently shipped a car. The Ely Valley Mining Co. is running with the usual force, but its manager, Edward Thomarson, is in London, where he has gone to confer with the other directors about important developments contemplated on that property. The company has several cars of ore on the dumps, but thus far has shipped none.

This region has a gold excitement which promises to develop into large proportions. The new camp has been named Atlanta, and adjoins the old camp of Silver Park which was started about 1868 by the overflow from the White Pine excitement. Its principal ores were silver chlorides in limestone, and were so rich that a large settlement was formed. When the stage line was put on from Hamilton to Pioche it went by way of Patterson, from which point a daily stage carried passengers and mail to Silver Park, 25 miles from Patterson and 45 from Pioche. Two Washoe mills were installed, which for a time found plenty of business. In 1872, when the mills of this region were insufficient to treat the ore mined here, some of it was hauled to Silver Park to be treated there. The decadence of both Patterson and Silver Park came before Pioche had seriously declined. Some of the best properties at Silver Park were secured by one Felix Knight, who worked them for years, hauling his ore to Pioche and shipping it out from here by wagon. In the early nineties Felix Knight died. The administrator of his estate sold his claims to Jesse Knight, the mining man of Provo, Utah, who has made such a phenomenal success at Tintic. There is said to be a close similarity between these Silver Park mines and those of the Tintic district. In October 1907 Mrs. Belle Fisher of Pioche went out to Silver Park to cook for the men who were doing the annual assessment work on Jesse Knight's unpatented claims. In her spare hours she wandered over the hills, prospecting. About two miles from the Knight camp she discovered some promising gossan. Taking out powder, fuse, caps, drills, and hammer, she drilled a hole, loaded it, and spit the fuse. At the first shot she broke rock which showed free gold, and then and there located four claims now known as the Atlanta group. Passing through intermediate ownership, these claims came recently into the possession of a syndicate which includes John L. Giroux and Elmer M. Bray, of Los Angeles, Frank Paul and others of Ely. The group is held under lease and bond for \$100,000, upon which a payment of \$3000 has been made through the assay firm of Marriage & Cosby of the Pioche Assay Office. F. Nugent Cosby of this firm was placed in charge. A shaft has already been sunk over 80 ft. At 20-ft. depth cross-cuts were run 20 ft. north and 15 ft. east. The rock from the cross-cuts and from the first 50 ft. of the shaft is said to have yielded average returns of more than \$10 per ton in gold. Below the 50-ft. level the ore is of higher value. No figures are given out, but mining men who have seen the ore estimate that it will run a hundred dollars per ton in gold at the present shaft-bottom.

A stage line has been established from Pioche to Atlanta. A town-site has been staked off, and lots have sold freely. The camp has a hotel with plenty of beds and is serving meals to transients; a restaurant; a store; and three saloons, besides a good many prospectors' shacks and tents. The gold is said to occur free in a belt of quartz lying west of and adjacent to the north and south dike of porphyry. On the west of the quartz belt is the limestone of the region. The quartz belt is said to have been traced for four consecutive miles and locations made the entire distance. It is claimed that free gold in what would be paying quantities has been found throughout the whole of this four-mile belt. The Atlanta Syndicate is jubilant over the result of its development and is taking bonds on many properties, making small initial payments. More than the usual amount of wrangling is going on over conflicting claims, and many lawyers are contemplating the situation with glee.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

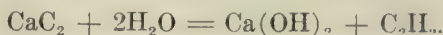
Single-hand drilling, when done by a skilled miner, in ordinary unoxidized ground, permits of 5 to 9 ft. of hole per 8-hour shift being drilled.

Periodicity in the maximum vibration of the piping leading to turbine engines is due to periodic synchronism between the rate of vibration of the piping and the number of pulsations of the steam admitted to the turbines.

Air-drills under show conditions have duties up to 10 or 12 ft. of drilling per hour in hard granite. Underground, with due allowance of time for setting up, picking down rock, etc., the duty is much reduced. In an 8-hour shift drills using two men ordinarily drill 20 to 40 ft. of hole. The one-man drills average 15 to 25 ft. per shift under actual working conditions.

Cyanidation of complex sulphide silver ores has attained a high degree of perfection in Mexico. The peculiarities of the Mexican method consist in fine grinding and agitation with air in tall tanks, known as Pachuca tanks, from the mining town where the system was elaborated. The pulp is then treated in vacuum filters for extraction of the solution. The Mexican method is also used at Tonopah, Nevada.

Calcium carbide when brought into contact with water reacts according to the equation:



The acetylene gas produced requires purifying, especially when used for illumination of houses. This is done with many substances, such as chromic acid, a mixture of bleaching powder and lead chromate, and acid cuprous chloride solution.

Geared hoisting engines are to be preferred for shallow depths and limited tonnage, on account of their low first cost. When great rope-speed is not essential they are fully as economical as direct-coupled engines. With greater depths and capacities speed becomes more important, and direct-coupled engines are necessary. For depths over 3000 ft. the starting load, on account of the weight of the rope, is greatly increased, and usually requires special consideration.

Sulphur dioxide (SO_2) is a pungent colorless gas, heavier than air (its specific gravity being 2.26). It is suffocating, and gives rise to most of the complaints which are made against smelter smoke, since it is carried to great distances, being a fixed gas, and being perceptible even when present in small quantities in the air. It is, however, not dangerous except in large volumes, and it has no effect upon vegetation. At ordinary temperatures it is absorbed in water, one volume of water taking up 20 volumes of the oxide.

Manganese ores are marketed chiefly at Pittsburg and Bessemer, Pennsylvania, and South Chicago,

Illinois. They are in demand chiefly for making spiegeleisen. Ores are sold on the basis of the unit (20 lb.) of manganese, a lower grade than 40% being unmarketable if the amount of silica exceeds 12%, and if the quantity of phosphorus is above 0.27%. The price per unit increases as the manganese content rises above 40%. Penalties are imposed on each unit of silica above 8%, and phosphorus is also penalized. The prices realized at the points of delivery range from \$5 to \$15 per long ton.

Sulphuric anhydride (SO_3) is evolved to some extent from the roasting of any sulphide, and is present in varying degree in all gases from the combustion of crude oil, coal, and from smelting furnaces. It is solid at a temperature of 58.64°F. , and is completely volatile at 114.8° . Sulphuric anhydride exists in two modifications, one being a liquid form which solidifies at 60.8°F. The condensation of SO_3 from gases is thus seen to present some serious difficulties, owing to the low temperature requisite. Attempts have been made to neutralize the SO_3 in furnace gases with zinc oxide, and the effort has met with some success. This is a logical solution of the problem if it can be made effective. The zinc sulphate produced would then be marketable as a paint.

Hydraulic mining is being conducted on a large scale at the La Grange mine in Trinity county, California, the annual output of gold being approximately a quarter of a million dollars. This mine is near Weaverville. Gravel mines are worked in many parts of Trinity and Siskiyou counties, the latter having over 100 such properties, yielding about \$217,000 per annum at the present time. Formerly the gravel mines of Siskiyou county produced more gold than all the other placer mines in California. The most important property today is the Quartz Valley Mining Co. at Greenview; other localities are Callahan, Cecilville, Forks of Salmon, Gazelle, Yreka, Seiad, and Hamburg. The restrictions of the anti-débris legislation do not affect the northern counties of California.

Prospecting with a diamond-drill can often be used to advantage, but two points must be kept in mind: (1) the sample obtained may be unrepresentative as to value, and, (2) deflection of the drill may carry it far away from its expected destination. A core-drill secures a small section, which is often ample for geological determinations, but the sample is only a small portion of a possibly large amount of ore, and may be either too high or too low in value. Two drill-holes passing through an orebody showed in the one case no payable ore, and in the other, 40 ft. of ore assaying \$80 per ton. Neither was right. The location, however, of the orebody is often, as it was in this case, of sufficient value to warrant the expense. In the mine a diamond-drill may often be used to prospect the walls and avoid expensive cross-cuts. There are various means of surveying drill-holes and allowing for the error introduced by deflection of the drill. At Johannesburg a copper wedge has been placed in the hole at a point above the orebody, and by deflecting the drill when re-introduced, served to enable two samples to be taken from one drill-hole,

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Gold in Eastern Nicaragua.

The Editor:

Sir—In your ‘Special Correspondence’ columns of the issue of April 24 appeared a communication relating to the gold mining industry on the east coast of Nicaragua. Some of the statements made apply to the interior of the country, but have no significance for other districts. Within the last few months considerable attention has been drawn to the gold mines of eastern Nicaragua, and for those desiring information the following facts may be of interest.

The area may generally be defined as extending north from the Escondido to the Wanks river and westward from the coast for a width of 100 miles. Mining activity has been confined mainly to the districts drained by the Pis-Pis river, a tributary of the Wanks, and the Banbana river, a tributary to the Principelea. Mining dates back for a period of 16 years, before which time some gold was exported that had been bartered from the Indians. It is said the Indians of the Siuna river were found using small nuggets of gold for sinkers of fish lines. A man named Schultz employed some Indians to wash gold, imposing upon each individual a daily task of filling one condensed-milk tin, for which the Indian received but 25c. in foodstuffs and clothes. The first mine to open up on a scale of importance was the Siempre Viva, which has now been producing 14 years. Other mines were opened from time to time, generally upon a small scale, building themselves up out of the profits, as in most instances the work was undertaken by men of small means, until at present there are nearly a score of properties being operated. The following table gives the gross value of the gold exports for each year ending June 30, since 1893:

| | |
|--------------------|-----------------------|
| 1893.....\$ 88,522 | 1902.....\$273,616 |
| 1894..... 109,477 | 1903..... 378,866 |
| 1895..... 94,369 | 1904..... 534,371 |
| 1896..... 137,929 | 1905..... 421,046 |
| 1897..... 169,565 | 1906..... 463,110 |
| 1898..... 254,840 | 1907..... 557,550 |
| 1899..... 229,262 | 1908..... 499,165 |
| 1900..... 301,127 | |
| 1901..... 234,383 | Total.....\$4,747,208 |

The types of deposits comprise veins and impregnations of irregular shaped bodies of decomposed porphyry. Only recently has one of the mines reached a considerable depth. The deposits are usually oxidized for a vertical depth of 300 to 400 ft. Above the water-level, from which all the gold so far has been produced, the ores are usually friable, with a tendency to being clayey. Light stamps are used in some of the mines, especially where the ore is more than usually hard, but in the greater number of deposits the ore is too soft for stamp-milling, and in such cases 3½ to 5-ft. Huntington mills are employed, and are particularly well adapted to the ore.

Surface disintegration of the outcrop often results in the formation of a mantle of rich soil spreading outward from the orebody as a centre, covering much more surface than the original outcrop. This is locally called a *manta*. These *mantas* are often of great extent, and the material being in a fine state of subdivision, permits recovery of the gold by most simple means, such as sluicing; and from the working of the *mantas*, especially if rich, sufficient returns are obtained to explore the orebody or even pay for the erection of a small milling plant. Narrow, isolated, well-defined veins are frequently found, known as *hilos*.

By far the greater number of the known ore deposits are situated in hills, so that the ore may be mined by open-cuts, with a system of adit-levels below for tramming out the ore, which is broken down into the mill-holes rising from the adits to the bottom of the cuts. No hoisting has been done to any extent



Map of Nicaragua.

in any of the mines, nor has the water-level been reached, except in one or two instances. Systematic development and creating an ore reserve are practices unknown in the district. Stoping has been done to a small extent, but entirely from one or two shallow levels driven along on the strike of the deposits; never at a deep level. Some of the mines, where work has been carried to the vicinity of water-level, show the presence of sulphides, galena, blende, copper, and iron pyrite. Usually there is little difference in value between the oxidized ore near the surface and that from the lower limit of the zone. Not enough is known of the deposits at or below water-level to make any statement as to the change in value of the ore. At the Santa Rita the sulphides contain about as much gold as the surface or oxidized ores. This deposit is a mineralized mass of decomposed porphyry, the ore at water-level being a mixture of chalcopyrite and pyrite, the gossan cap of which, some 400 ft. deep, is being worked for gold.

The metallurgical operations are most simple. Amalgamation alone, or followed by cyanidation of the coarse tailing, is the practice at all places except Santa Rita, where the coarse sand is separated from the tailing and re-ground, thence to pass over

amalgamating and blanket-tables. The tailing from this operation contains too little gold to pay for further treatment. Some of the mines are now reaching the deeper zones of ore, requiring much greater skill and more elaborate methods to economically win the gold content. The following is a list of the mines now operating that are provided with milling facilities:

| Mine and District. | Stamps. | Tons. | Power. |
|--------------------------------|---------|---------|-----------------|
| PROSPECTING MILLS. | | | |
| El Paraíso, Ococonwas..... | ... | ... | |
| Rosa Lee, Pis-Pis..... | ... | ... | Water. |
| Morning Star, Pis-Pis..... | ... | ... | |
| STAMP-MILLS. | | | |
| Colonia, Pis-Pis | 5 | 15 | Water. |
| Constancia, Pis-Pis | 5 | 15 | Water. |
| Josefina, Pis-Pis | 6 | 18 | Steam. |
| Concordia, Pis-Pis | 10 | 25 | Water. |
| *Siempre Viva, Pis-Pis | 20 | 60 | Hydro-electric. |
| *Topaz, Rama | 20 | 60 | Water. |
| *Lone Star, Pis-Pis | 30 | 100 | Water. |
| 3½-Ft. HUNTINGTON MILLS. | | | |
| Minnesota, Banbana | 1 | 15 | Steam. |
| San Antonio, Ococonwas..... | 1 | Closed. | Steam. |
| Monte de Oro, Siuna..... | 1 | Closed. | |
| Mars, Pis-Pis | 2 | 30 | Hydro-electric. |
| *Bonanza, Pis-Pis | 8 | 120 | Hydro-electric. |
| 5-Ft. HUNTINGTON MILLS. | | | |
| La Luna, Ococonwas | 1 | 30 | Steam. |
| *La Luz y Los Angeles, Pis-Pis | 2 | 75 | Steam. |
| Monte Carmelo, Banbana..... | 3 | 120 | Steam. |
| Santa Rita, Banbana. | 5 | 250 | Steam. |

The Terciopelo mine, on the Banbana river, is being equipped with log-washers to disintegrate a gold-bearing clayey *manta*, the gold to be recovered by means of sluices and Pierce amalgamators. At all the above-mentioned mines the gold is recovered by amalgamation. Those mines equipped with a cyanide plant for treating the sand are marked with an asterisk (*).

Where a supply of water can be obtained for power the first cost of a milling plant and the expense of operation is greatly reduced. The Pis-Pis district is more favorably provided with water-power than the Ococonwas and Banbana districts. The largest hydro-electric plant is that of the Siempre Viva mine, situated below the falls of the Pis-Pis river. This company rents power to some of the neighboring mines, and if the total power the falls could be made to supply were availed of, power enough might be generated to run nearly all the mines of that district. Where a steam-plant is required, there is usually an abundant supply of wood for fuel, which, if a long haul is not required, can generally be laid down at the boilers for \$3.50 U. S. Cy. per cord.

During the dry season many mines depending upon water-power are obliged to close part of their plant, and during exceptionally dry weather there often is a shortage of water for milling purposes, even at those plants where steam-power is used. In most instances a pumping station placed at the river-side could be utilized during the dry weather without causing a prohibitive increase in operating expenses.

The country is sparsely populated; but so far no one has been annoyed to any great extent by shortage of labor. Mosquito Indians, Nicaraguans, and blacks from the West Indies comprise the available labor supply. Should operations at the mines ever exceed the supply of labor the country can furnish, abundant labor could be brought in from the West

Indies. The part of Honduras bordering on the east of Nicaragua is very sparsely populated, and could not be counted upon as a source of labor. The interior of the country might furnish recruits, but as a rule the natives do not care to come down to the lowlands of the coast. Typical rates of wages are given in the following table:

| | Soles per diem. |
|------------------|-----------------|
| Timber-men | 3.00 |
| Drill-men | 2.50 |
| Miners | 2.00 |
| Trammers | 1.75 |
| Mill-men | 1.50 to 300 |
| Fire-men | 300 |
| Carpenters | 2.00 to 6.00 |

The mines provide lodging and board, for which no charge is made to employees. The cost of boarding varies between 40 and 80c., U. S. Cy., per diem. Almost all food-supplies are imported from the States. The laborers' meals comprise rice, beans, bread, coffee, and fresh meat. Most of the mines have made no attempt to cultivate their territory with a view to raising their own foodstuffs. The soil is generally productive and several crops per year may be realized. The natives would be content with what the soil could produce, and by cultivation of the land, imports of foodstuffs could be reduced to lard and such supplies, that cannot be grown. The labor is very efficient—the best I have seen south of the Rio Grande—but the malarial fever of the coast makes it necessary for most of the mines to keep on hand more laborers than ordinarily would be required, to replace those who lay off from sickness. The natives, especially the Indians, are nomadic, and rarely stay in one place more than three months at a time. Silver money is in circulation, paper being unknown. The current rate of exchange is 38c., U. C. Cy., as the equivalent of one sol. Coinages of all the Central and South American Republics pass at the same rate. The amount of coin in circulation is far from enough to supply the mines; liquidation of laborers' accounts has to be made in greater part by means of drafts on the merchants, the laborers exchanging them for merchandise and such cash as they can get.

The costs of mining and milling do not vary to a great extent in the different districts. Mining by the open-cut method costs from 12 to 30c., U. S. Cy., per ton; milling, from 45 to 80c.; other charges bring the costs up to \$1.25 to \$2 per ton, depending largely upon the size of the plant. Cyaniding of the sand costs from \$1.10 to \$2 per ton. A two 5-ft. Huntington-mill plant, operated by steam-power, can be installed in most places for an expenditure of \$20,000; the accessibility of the mine affects the figure to a great extent. A cyanide plant to treat 80 tons of sand per day would cost in the neighborhood of \$60,000 for a simple leaching equipment for sand, and no facilities for treating slime. This figure would not include any grinding machinery.

The rivers rising in the foot-hills of the eastern mountain chains of the country flow eastward into the Caribbean. They are navigable for the lower 60 miles by any vessel that can cross the bars at their mouths, where usually there are not more than 4 or 5 ft. of water. The Escondido and Wanks rivers are

navigated by river steamers; the whole of the Principulea and Banbana and the upper waters of the Wanks, Wasspue, and Pis-Pis are only navigable by native dugout canoes or pit-pans, the largest of which carry cargoes of 13,000 lb. At the head-waters, near the end of canoe navigation, rapids are found in the rivers, but covered usually with enough water to permit the pit-pans being hauled over. Some of the mines have to pack their freight by bull-teams for several miles. In the rainy season the rivers are subject to inundations often rising 40 ft. in a few hours.

Fruit steamers ply between New Orleans and Blue-

opened by the concessionaires, although some of the concessions have been in effect for several years. Early in 1908 a grant was conceded by the Government covering an area 2½ kilometres on each side of the Siuna and Matis rivers and the Banbana river from its junction with the Bana Cruz, the grant including the tributaries of all these streams as far as the head-waters. Before the concession was made there were many prospectors in the field, but for the last year practically no search for new mineral locations has been carried on. The mining laws of the country are liberal, and would attract prospectors if concessions had not been granted excluding prospectors from the best part of the field.

All the mines so far have been opened by people of small means, who increased their scale of operations out of the profits of exploitation in a small way. The country is extensively mineralized, the ores being of low medium grade as a rule, ranging between the averages of \$4 and \$10 per ton, and no bonanzas have been found. A few placer deposits have been discovered, but have never been worked except by crude methods and spasmodically.

In parts of the country not included in the concession, or land denounced before the concession went into effect, very good prospects, with extensive *manta* deposits, sufficient to warrant opening on a small scale, and



Walpatara Rapids, Banbana River.

fields and Cape Gracias á Dios. Freight for Principulea is carried up the coast in small gasoline schooners. The freight from New Orleans to the mines varies between 4 and 8c., U. S. Cy., per pound, the higher rate representing the cost at mines where hauling by bulls has to be resorted to. No import duties are collected for mining machinery; all food-stuffs for the mines, except those granted under concessions, are subject to a high import tariff. Typical rates of duty are as follows:

| | U. S. Cy. |
|-------------------------|-----------|
| Flour, per bbl. | \$1.45 |
| Beans, per 100 lb. | 0.95 |
| Rice, per 100 lb. | 1.18 |
| Lard, per 125 lb. | 9.40 |

Other duties are collected at a much higher proportional rate. There is an export duty on gold at the rate of 50c., U. S. Cy., per fine ounce of metal, payable in Government bonds under a penalty of an increase of 50%. Before the miners had a chance to buy a supply, speculators cornered the entire bond issue, and sold again at an increase of very nearly 50%. The export duty is considered a hard burden by the miners, and rather unjust, as the whole business of the northern east coast is dependent upon the mining industry.

Concessions have been granted to individuals covering such articles as tobacco, liquors, and explosives. The concessionaires demand high rates for the privilege of importing such articles as the concessions cover, the amount often exceeding the first cost in the United States. On dynamite one must pay the concessionaires \$280, U. S. Cy., per ton. Several mining concessions have been granted without in a single instance a mine or prospect having been

denounced before the concession went into effect, very good prospects, with extensive *manta* deposits, sufficient to warrant opening on a small scale, and



Santa Rita Mine.

with exceptional promise of finding a fair-sized ore-body may be obtained, at prices ranging from \$1000 to \$15,000, U. S. Cy., under terms of payment which will permit of considerable exploration, opening up and erection of a small mill, for about \$25,000, and if operations be commenced at once, they permit of making the greater part of the payments for the property out of profits. There are many prospects showing a long and continuous outcrop or *manta* of ore of sufficient value and large enough extent to warrant the risk of the amount mentioned. In this way most of the mines have been opened that are now being profitably worked. There have been some failures, but not many, and in most instances failures resulted in attempting to exploit prospects which held forth not one iota of promise

from the start. Those who will neither take too optimistic nor pessimistic a view, who can estimate the probable worth of an undeveloped deposit, and will risk a comparatively small sum, will be the ones to open up the country.

There are no actual ore reserves in any of the mines, and a field for investment of large capital would be restricted to buying up those mines which have been profitably producing for the past four or five years. While, strictly speaking, these mines are undeveloped, still the work that has been done is sufficient to reveal the nature of the deposit, allow an appropriate valuation of the ore being made, and a reasonable estimate of the probable future life.

Could several of the larger properties be combined under one management, with a staff of capable engineers, with capital enough to enlarge mills, permit clearing the rivers and improving transportation, the profits from many properties could be greatly increased, and certain of them now barely paying expenses might be made to yield handsome returns. Many small properties have not been profitable simply because the owners could not afford to carry a sufficient supply of repair parts for the machinery, and break-downs caused delays, permitting expenses to run up beyond hope of recovery before their mills could start again.

The climate is typical of tropical low-lands. The land is poorly drained, covered with a dense tropical forest, and infested with malarial fever. The more pernicious tropical diseases, such as yellow fever, bubonic plague, berri-berri, and the like, are unknown. The rainy season lasts from the middle of May to the end of November, during which time the greater part of the 130 inches of average annual rainfall occurs.

CLARENCE CARLETON SEMPLE.

Bluefields, Nicaragua, May 25.

Platoro, Colorado.

The Editor:

Sir—There is a mineral district in Rio Grande and Conejos counties, in southern Colorado, which produced large quantities of gold and silver when the mines were in operation a few years ago, both from the milling of surface ores carrying free gold, and the shipping of high-grade refractory ores. Owing to gross mismanagement and the base character of the low-grade ores in depth, together with the great expense of operation, they were closed until improved methods of milling, better means of transportation and cheaper power would enable them to be operated at a profit once more. This district extends from Summitville on the north to Platoro on the south, a distance of seven miles, and about five miles in width. The lowest formation exposed is a massive diorite, cut by later parallel dikes of similar character, carrying large quartz fissure-veins, containing gold and silver—besides sulphides in the southern part of the district. The northern portion is capped with a later flow of rhyolite, carrying large quantities of iron sulphide, containing little gold and silver. This capping has been penetrated by the dikes in the underlying diorite formation, notably at South mountain, Summitville, where a large quan-

tity of 'free gold' was milled from the surface ores. Lower levels show a refractory, low-grade, sulphide ore, which can only be treated at a profit by modern milling methods, combined with other economies. An idea of the possibilities of this district may be had from the following instance, coming under my own observation.

One of the developed properties in Platoro was thoroughly sampled by a well known mining engineer. His report showed that a tunnel driven on the vein, about 1500 ft. long, with drifts, stopes, raises, and winzes at various points, showed the vein to vary from 20 to 30 ft. wide, giving average assay values of over \$11 per ton in gold and silver. The ore when tested by a reliable firm in Denver, Colorado, with an improved cyanide process, gave an extraction of 85%, at an estimated expense of \$2 to \$3 per ton for milling at the mine; the exact cost depending upon the size of the plant installed. Mining expenses of \$2 per ton in this case would ensure a profit of \$4 to \$5 per ton. Negotiations are now pending on this property. There are a number of other properties in the district showing bodies of ore containing from \$7 per ton up. A company is now making preliminary arrangements for the installation of a large hydro-electric power-plant, on the Conejos river, only 12 miles below Platoro. This will generate sufficient power to supply the mines and mills in the camp, as well as operating an electric line from some point on the D. & R. G. railway in the San Luis valley, to the camp, a distance of 40 miles. It is estimated that from having an electric railway for transportation, and electric power for mining and milling operations, there will be a saving of at least one dollar per ton upon every ton of ore handled. This will enable operators to mine and mill \$7 ore at a profit.

Platoro, Colorado, July 20.

CHAS. S. BARNES.

Petroleum production in 1908 increased rather as a result of activity in the three great fields—California, Oklahoma, and Illinois—than the discovery of any considerable new fields. The principal new field to gain prominence was the Caddo pool, in northwestern Louisiana. The hoped for increase in production from the Markham and Goose Creek fields in Texas did not materialize, and the total from that State showed a decline in spite of the increased production in the Humble pool. In the Appalachian field 7115 new wells were drilled, of which 5292 were producers, with a total initial production of 55,002 bbl.; in the Lima-Indiana region 1250 new wells were drilled, of which 1088 were producers; in the new Illinois field 3574 wells were drilled, of which 3019 were producers, with an average initial production of 26 bbl. per well. In the Mid-Continent field 3490 wells were drilled, of which 2587 were producers of oil, 471 were producers of gas, and 432 were dry; the initial production of the producing wells averaged 83.7 bbl. In the Gulf field only 819 new wells were drilled, 606 being producers and showing an initial production of 297 bbl. In California 617 wells were drilled, of which 594 were productive, and in other parts of the country 44 wells were drilled, yielding 24 new producers.

YAMPA SMELTER, BINGHAM, UTAH.

Written for the MINING AND SCIENTIFIC PRESS
By LEROY A. PALMER.

The Yampa smelter affords a typical example of modern copper smelting practice, containing, as it does, all of the appliances necessary for the conversion of crude ore into blister copper ready for the refinery. It is a plant of 1000 to 1200 tons daily capacity situated in Bingham Canyon, Utah, about a mile and a half from the mine, with which it is connected by a Bleichert aerial tramway. The canyon is narrow for its entire length, and the site chosen on the side of the mountain possesses some disadvantages, but as these could be obviated only by going some distance into the valley, and thereby sacrificing the advantages gained by proximity to the mine, besides subjecting the plant to the danger of

as follows: it is loaded into 3500-lb. cars, which are hauled by motors to the top floor of the roaster building, and charged into the McDougall roasters. The McDougall building, as are the others, is of structural steel, with corrugated iron-sheathing. It is built in three floors to afford ready access to the various parts of the furnaces, of which there are nine. Each furnace is 18 ft. diam., with six hearths, and two arms to each hearth, each arm making a complete revolution in 56 seconds. The ore is dumped into hoppers, from which it feeds into the furnace, the arms spread it out and scrape it over the hearth, finally discharging it over the edge to the hearth beneath, where the process is repeated with the ore working toward the centre. In this way the charge is slowly scraped over the six decks, being constantly rabbled, and exposed to the action of the heat until the sulphur-content is reduced from 30 to



Yampa Smelter.

adverse litigation because of farmers, the canyon-site was decided upon as the better. All things considered, the plant as laid out is as convenient for economical operation as well could be.

The ore is received over the aerial tramway in 1500-lb. buckets, and dumped into the bins by hand, every tenth bucket being dumped to the sample bin. The ore to be sampled is discharged to a 10 by 20-in. Blake crusher, elevated and passed through a 5-in. trommel, the oversize going to a set of 14 by 28-in. Cornish rolls. The undersize from the trommel is elevated, each twentieth bucket being dumped separately, and a one-tenth cut taken from it by a Vezin sampler. This sampling is carried on only on the night shift. On the day shift the ore is fed to a 3 by 8-ft. trommel of heavy plate, with 1-in. punched holes, on a frame of four 6-in. angle-irons. The oversize is run to its bin by an inclined conveyor, and the undersize elevated and passed through the 5/8-in. trommel, the oversize going to the bin with the coarse and the undersize to a separate bin.

The progress of the fine ore through the plant is

about 5%. Coal is used in starting the furnaces, but once started, the sulphur in the ore supplies sufficient heat for the operation. Each McDougall furnace is supplied with two 30-in. elbows, which discharge the fume to the dust-chamber. This is of brick, 20 by 32 ft. 8 in. by 60 ft., terminating in a brick stack 120 by 10 ft. Brick baffle-walls are provided to check the current of the gases and allow them to deposit the dust, which falls into square steel hoppers. Cars are run beneath these hoppers and the dust loaded into them for treatment in the reverberatory furnaces. The accretions which accumulate on the walls of the roasters are barred off at intervals, and trammed to a bin adjacent to the coarse-ore bins, from which they are taken to the blast-furnaces. A 20-hp. direct-current Bullock motor drives the McDougalls.

The roasted ore, or calcine, as it is called, is discharged from square hoppers at the bottom of each furnace to 7300-lb. cars, and hauled to the reverberatory furnaces in the adjoining building. These are three in number, a 17 by 45-ft. of 150 tons capacity,

and two 17 by 55-ft. of 175 tons each. The brickwork is stayed by 4-in. I-beams, tied across the top by buckstays spaced on 16-in. centres except where two doors, each 15 by 24 in., are placed in each side to allow the furnace-men to rabble the charge. The fire-boxes are 8 by 12 by 14 ft., and both ore and fuel are fed from the top through square hoppers, there being three 15-in. openings for fuel and seven 12-in. openings for the calcine. Blast for the fire-boxes is furnished by a 16-in. No. 9 Buffalo Forge Co.'s centrifugal blower, direct-connected to a 20-hp. Allis-Chalmers induction motor. No fluxes are used in the reverberatory furnaces, the slag being controlled by the roasting process, which aims to leave an amount of sulphur in the calcine which will take up a sufficient amount of iron into the matte to leave the correct proportions of silica, iron, and lime to form the proper slag. The slag is tapped from the furnace to iron launders and run to 60-ft. slag-cars, which are hauled by a General Electric locomotive to the slag-dump. All slag from the reverberatory and blast-furnaces is wasted, being sufficiently clean so that there is no object in saving the shells.

The matte is tapped into molds and cast into ingots 9 by 20 by 48 in. These ingots are broken up by hand, and re-melted in the blast-furnace before going to the converters. This is the chief disadvantage of the location of the plant in the canyon, the topography not allowing the placing of the converter-plant so that the matte can be carried hot from the reverberatories to the converters. The disadvantage, however, is not so great as would appear at first, as the matte is used in making up the blast-furnace charges in place of the slag or slag-shells which usually enter into their composition. The fume from each reverberatory passes through a chamber in which is a 300-hp. Rust water-tube boiler, using the waste heat of the furnace to generate steam at 110-lb. pressure. One of these boilers is a type B, and the others are type C. They are fed by a 7 by 4½ by 8-in. duplex Snow piston-pump, a 5 by 5½ by 8-in. duplex Smith-Vaile plunger-pump being held in reserve. An 8 by 5 by 12-in. Fairbanks-Morse pump supplies water at high pressure for fire and for operating the turbo boiler-washers. The steam from these boilers is carried direct to the engines without the use of a superheating boiler. As the dust losses from the reverberatories are very small, no dust chambers have been provided, the fume discharging from the boiler-chambers to a brick-stack 7 by 100 feet.

An average analysis of several reverberatory slags shows:

| | % |
|--------------------------------------|------|
| FeO | 38.4 |
| SiO ₂ | 39.3 |
| CaO | 4.2 |
| Al ₂ O ₃ | 4.9 |

The coarse ore which is separated from the fine by the trommels is unloaded through hand-gates to motor-drawn cars, in the same train with which the fluxes are loaded and hauled to the blast-furnaces. Having determined by experiment, backed to a large extent by experience, the slag which is best adapted to the quality of ore which is to be treated, the smelter superintendent calculates his charge by a

comparatively simple stoichiometrical operation. It is customary to allow 90% of the slag to silica, ferrous oxide, and calcium oxide, the remaining 10% being accounted for by aluminium oxide, barium oxide, manganese oxide, and such other compounds as may be present in the ore. Having determined upon the grade of matte which it is desirable to make, governed, of course, by that possible with the ore in hand, a formula for the matte of Cu₂SFeS is usually assumed, and the content of the matte computed from it. Knowing the amount of iron that must go toward the composition of the matte, that left available for forming slag is computed to ferrous oxide, and placed against the silica and lime in the charge. Knowing, then, the composition of the desired slag and the excesses or deficiencies in the ore of the constituents, the smelter-man mixes his ores so that they will present the proper proportions of the slag-forming materials.

The Yampa is at present converting a very low-grade matte, probably the lowest of any smelter in the country. Tests are being carried on at present as to whether it is advisable to increase the grade, and the management therefore does not consider it advisable to publish its analysis. For this reason I cannot at this writing give a concrete example of slag-calculation at this plant. The method described is the one in vogue. The usual slag-composition in copper-smelting practice is from 30 to 38% silica, the remainder of the 90% being ferrous oxide and calcium oxide, and at the Anaconda works, which are regarded as an advanced type of copper-smelter, it is aimed to keep the silicious content of the slag as near 36% as possible. At the Yampa it is found that excellent results are obtained from a highly silicious slag, 45 to 46% SiO₂, which is desirable, as there is a saving in limestone, and a corresponding increase in the amount of ore treated in a given time and with practically the same amount of fuel.

The Yampa ore is of quite uniform quality, and in its crude state forms an excellent smelting mixture, its composition averaging about 2% copper and 30% each of silica, iron, and sulphur. The process of making up the charges is therefore simple, and would perhaps appear crude to one accustomed to custom-plants where many lots of varying quality are treated each day. The train is drawn in front of the coarse-ore bins, beside which are the bins containing the fluxes, and a charge loaded as follows: crude ore, 4000 lb.; lime, 1400; reverberatory matte, 300; coke, 600, the fuel therefore forming 9.5% of the total charge. The standard type of side-dumping slag-cars are used for charging, and are hauled to the furnace and the contents dumped bodily through a side door with counterweights which are raised and lowered in guides. On the day shift from five to eight 'dope' charges are added, made up as above, with the addition of 3000 lb. of slag. The slag being readily fusible tends to make the mass more molten, and to prevent the forming of accretions on the walls of the furnace. These accretions, if allowed to form, must be barred off at considerable trouble, since if neglected they will increase in size, preventing the blast from reaching all portions of the charge until the furnace finally freezes. In

that case it must be shut down and bored out, an operation which sometimes entails an expense of some thousands of dollars.

The blast-furnace building contains three furnaces, as follows: one 44 by 180 in. at the tuyeres and 66 by 180 in. at the shaft, giving a ratio of shaft to tuyere area of $1\frac{1}{2}$ to 1. There are three water-jackets on each side, and one on each end. Each side has eighteen 3-in. tuyeres, spaced 10 in. apart, with siamesed tuyere-pipes, individual valves, and all metal connection to the 18-in. bustle-pipe.

The forehearth is circular, of fire-brick, 2 by 11 ft. inside. The fume discharges through a brick down-take 48 by 102 in. One furnace, 42 by 168 in. at the tuyeres, and 72 by 186 in. at the shaft, ratio of shaft to tuyere area $1\frac{3}{4}$ to 1, three jackets on each side, and one on each end, eighteen 3-in. tuyeres 9 in. apart, with a low 15-in. bustle-pipe having metal connections to the tuyeres, which are controlled by individual valves, circular brick forehearth 3 by 12 ft. inside, and 72 by 92 in. brick down-take.

One furnace 44 by 186 in. at the tuyeres and 66 by 186 in. at the shaft, having ratio of shaft to tuyere area of $1\frac{1}{2}$ to 1, six jackets on each side, and two on each end, sixteen 5-in. tuyeres with metal and canvas connections to the 18-in. bustle-pipe, the tuyeres being regulated in groups; circular brick forehearth 3 by 16 ft., and brick down-take 72 by 118 inches.

The main air-line is 40 in. diam., and delivers air to the furnaces at 32 oz. pressure. Each furnace has a daily capacity of 175 to 200 tons of ore and flux. Tapping is carried on continuously, the slag overflowing to 30-ft. slag-cars, to be hauled to the dump by electric locomotives.

As the matte accumulates it is tapped to a channel in the earthen floor, and run to the converter-building adjoining the blast-furnace building. Here in the floor are brick-lined pits 9 by 9 by 9 ft., of sufficient size to hold the 5-ton ladles in which the matte is caught. A 20-ton Morgan electric crane handles the ladles and converters. The fume from the blast-furnace discharges through the down-takes to a square brick dust-chamber with brick baffle-walls 20 by 20 by 400 ft., terminating in a steel stack 7 by 200 ft. The stack follows the slope of the hillside, except for the last 50 ft., which is vertical, and although it is not provided with a fire-brick lining, as is frequently the case, it is still in first-class condition after 5 years' use. The dust is withdrawn through 15 by 18-in. doors, spaced on 14-ft. centres, to small cars which are hauled to the top of the reverberatory building by an electric hoist, and dumped into the furnaces.

An average analysis of blast-furnace slag shows:

| | % |
|--------------------------------------|-----|
| SiO ₂ | 45 |
| FeO | 25 |
| CaO | 17 |
| Al ₂ O ₃ | 6.9 |

In the converter-building are six 84 by 126-in. Allis-Chalmers Leghorn converters, and two stands. The converters have fourteen 1-in. tuyeres, receiving blast of 15-lb. pressure per square inch. Silicious ore is used for converter-linings. It is fed from the

bin provided for it through a No. 4 Gates gyratory crusher, reducing to 1 in., thence to a 6-ft. Allis-Chalmers pug-mill with stationary spindle and revolving bottom, in which it is ground and mixed with about 20% of wet clay as a binder. The lining is tamped in by a $3\frac{1}{2}$ -in. Ingersoll-Rand piston-drill with a 4-in. flat shoe, operating under 80-lb. air-pressure. The converter slag is poured into ladles which are hoisted by the crane, and the contents returned while hot by means of an iron launder to the forehearth of the No. 1 blast-furnace. The blister copper, which is 99% pure, is cast into 300-lb. ingots, and run down a balanced gravity plane to box-cars.

The power plant of the Yampa presents an example of efficiency that is worthy of more than passing notice. In the boiler-room are four 85-hp. return-tubular boilers generating steam at 120-lb. pressure. A 7 by $4\frac{1}{2}$ by 8-in. duplex Snow piston-pump feeds these boilers, and a similar pump raises the hot feed-water to the feed-pump for the waste-heat boilers connected to the reverberatory furnaces.

In the engine-room is the following equipment: one 12 by 30-in. 110-hp. Allis-Chalmers Corliss engine, direct-connected to a Connersville blower making 130 r. p. m., with a capacity of 100 cu. ft. per revolution; one 150-hp. Bullock induction motor, belted to a Connersville blower making 140 r. p. m., with a capacity of 100 cu. ft. per revolution; one 10 by 10-in. 70-hp. Ideal slide-valve engine, belted to a Connersville blower making 165 r. p. m., with a capacity of 55 cu. ft. per revolution; one 11 by 12-in. 75-hp. Ideal slide-valve engine making 300 r. p. m., direct connected to a 440-volt direct-current generator; one 16 by 16-in. 175-hp. Skinner slide-valve engine making 250 r. p. m., direct-connected to a 440-volt direct-current generator; one 30-hp. 14 by 14 by 20-in. Rand compressor, having a capacity of 75 cu. ft. of free air per minute, compressing to 80 lb. for the blacksmith shop, tamping machine, etc.; one 250-hp. Allis-Chalmers 16 by 34 by 48-in. tandem engine, connected to duplex air-cylinders 34 by 48 in., with a capacity of 7800 cu. ft. of free air per minute, compressing to 15 lb. for the converters.

With the exception of the Skinner, these engines are all connected to a Wheeler 16-in. barometric jet-condenser, with a 5 by 12 by 8 in. dry vacuum pump, giving a vacuum of 20 in., the altitude of the plant being 7000 ft., where the mercury column registers 22.64 in. The exhaust from the Skinner engine is carried to an open feed-water heater which raises the temperature from 54 to 194°, so that at this altitude, where the boiling point is 198° F., the feed is practically boiling when it enters the boilers. This increase in temperature is equal to $4\frac{1}{2}$ lb. of steam-pressure. The coal consumption for the battery of four 85-hp. boilers, averages 325 to 350 tons per month.

Water is obtained from a shaft sunk on the property, which gives a minimum flow of 150 gal. per minute. The shaft is equipped with three pumps, two 14 by 7 by 13-in. Cameron sinkers, with a capacity of 200 gal. per minute, and a Gould 8 by 10-in. single-acting triplex, with a capacity of 260 gal. per minute. One pump working at a time raises the water to a receiving tank, which also receives the

water from the main cooling-tower. From this tank an Aldrich pump, 13 by 12-in. vertical triplex, 900 gal., belt-driven by a 75-hp. induction motor, and a Gould pump, 8 by 10-in. vertical triplex, belt-driven by a 25-hp. direct-current motor, raise the water to a 30,000-gal. tank above the plant, from which it is distributed by gravity. In reserve as auxiliaries to these pumps are a 12 by 7 by 12-in. Knowles 200-gal., a 10 by 5 by 12-in. Knowles 100-gal., and a 14 by 7 by 13-in. Cameron sinker 200-gal. The water after being used runs to a cooling-tower and passes over a $\frac{1}{4}$ -in. screen to clean it before spraying. The cooling-tower effects a reduction of about 30° F. in the temperature. The condenser-water runs from the hot-well to a second cooling-tower, from which a 6-in. two-stage Wheeler high-lift pump, of 1000 gal. capacity, driven by a 50-hp. induction-motor, raises it against a head of 70 ft. to the tank, from which it flows by gravity to the condensers. A 300-hp., 440-volt, induction-motor, direct-connected to a 220-volt direct-current generator, supplies power for the motor haulage. This power is derived from the Teluride Power Co., and to guard against serious shut-downs from accident to the steam-generator units, 300 additional horse-power are provided for, the transformer-house being equipped with six 100-hp. transformers, three oil-cooled and three water-cooled. As previously stated, the plant is convenient to the mine, and so situated as to be free from hostile litigation on account of fume. Sufficient silica is derived from its own ores, coke is shipped in from Sunnyside, about 175 miles distant, and lime-rock from Parley's Canyon, 35 miles away. In collecting the data for this article acknowledgment is due the courteous assistance rendered by C. A. Pringle, general manager, and Frank Murphy and Thomas Maslon, superintendent and master mechanic respectively of the smelter.

Free assays are made by several of the States, but attention has recently been called by the U. S. Geological Survey to the fact that it does not make analyses or assays of ores or metals for the public. Many specimens and samples are sent to the Survey with request for assay. The most that can be done in such cases is for the Survey geologists to give an off-hand opinion based on a simple examination of the specimen; but if an assay is desired the proper course is to employ a private assayer or to send the specimen to one of the Government assay offices, where a regular charge is made for such work. Government assay offices are situated at Carson, Nev.; Seattle, Wash.; Boise, Idaho; Helena, Mont.; Deadwood, S. Dak.; Salt Lake City, Utah; St. Louis, Mo.; Charlotte, N. C.; and New York, N. Y.

West Virginia more than any other coal-producing State depends on market conditions outside of her own borders for the disposition of her coal product. The manufacturing industries of the State are comparatively unimportant when considered in connection with the large and cheap supply of high-grade fuel. Probably more than half of West Virginia's coal is shipped away to support manufacturing industries in other States.

INNOKO ALASKA DISTRICT.

Since the discovery of placer gold in paying quantities on the headwaters of Innoko river, a tributary of the Yukon, in 1906, that part of Alaska has received more attention from prospectors looking for new fields than any other district in the Yukon valley. During the last three years probably 1500 men have visited the Innoko country. A paper on this district by A. G. Maddren appears in the U. S. Geological Survey's Bulletin 379. A more detailed report is in preparation and will be issued later as a separate bulletin.

According to Mr. Maddren, the Innoko is about 500 miles long, and drains an extensive, moderately mountainous area between the Kaiyuh and Kuskokwim mountains, which separate it from the two largest rivers in Alaska, the Yukon and the Kuskokwim, on the northwest and southeast, respectively. The placer diggings are accessible in summer by way of these two rivers, the Kuskokwim route being considered by Mr. Maddren the better, as it involves but one transfer of freight. This route, however, requires an overland haul of 35 miles from the forks of the Takotna, a tributary of the Kuskokwim, to Ophir, on the Innoko. The winter routes to the valley are much shorter, as its lower portion is then frozen over.

Gold occurs in the Innoko county in placer deposits, and possibly in lodes, though so far the only production has been derived from the placers. These are all comparatively shallow—not more than 35 ft. in depth—and are in large part frozen. Most of the work already done on them may be classed as a mere prospecting of the ground. The area of economic importance lies near the headwaters of the Innoko, in a region of low mountains, and paying quantities of placer gold have been found on Ganes, Little, and Ophir creeks, all tributaries of the main river. The gold occurs in the present stream gravels and in bench gravels averaging about 60 ft. above the streams. Ganes creek is a large stream with ample water for hydraulicking, though the grade is such that the tailing would have to be elevated or disposed of by some mechanical means. The other two streams are smaller and there is some doubt whether they contain enough pay gravel to justify the expense of bringing water for hydraulicking from a distance. However, a comprehensive scheme of hydraulic mining seems to promise most for working the deposits of this district with the greatest possible profit. Such a scheme would involve thorough prospecting of all the gold-bearing ground under expert supervision, the bringing of water from a considerable distance, and the consolidating of all property interests. That the last item would be a considerable undertaking is indicated by the fact that about 1200 placer mining claims have been recorded in the Innoko district.

The total gold production of the district for 1907-8 is estimated at \$85,200, of which the season of 1908 is credited with \$72,100. Four claims have produced more than \$10,000 each in a single season, but none has reached \$20,000. The Innoko placer gold is very pure, its fineness being about 0.915.

CLASSIFICATION OF PUBLIC LANDS.

By GEORGE OTIS SMITH.

*The necessity for classifying the public land is not recent. The earliest land legislation in this country both contemplated differences in the quality and character of the public land and planned that the officers charged with their sale should be furnished with descriptions based on field examination. From 1796 down to the present day, whatever the policy that has prompted legislation with reference to public land, whether the purpose was to procure revenue, or to promote home building, or to benefit influential citizens, most of these laws recognize classes of land and presuppose classification. Yet even the honest administration of the land laws has ever been subject to criticism arising from the fact that no adequate provision was made for land classification.

A period of national awakening to the worth of the public domain appears to have followed the close of the Civil War, and in the late seventies Congress gave serious consideration to the problem of making better provision for effective administration of this great estate with its latent possibilities for national growth. We have just entered upon another epoch of realization by the nation of the true source of its wealth and prosperity, and both the legislative and the executive branches of the Federal Government are awake to the fact that exact knowledge is essential to the proper utilization of our country's great resource of land. The earlier propaganda bore fruit in the creation of a scientific bureau, first among whose functions was the classification of the public land. But this specific duty laid upon the new Federal bureau was subordinated to the more general though hardly less important task of determining the natural resources of the public domain and the opportunity for a scientific classification of the land before the larger part of the more valuable areas had passed into private ownership was lost. In the present period of aroused public opinion the land classification which leads to better use, and the field knowledge on which intelligent administration must be based, have come to be regarded as vital factors in the public land policy.

The Secretary of the Interior may be considered to be a trustee charged with the disposition of the public land, and within his department the functions of administration are divided among three bureaus: to the General Land Office belong the subdivisional surveys, the sales and the issuance of patents; to the Geological Survey has been entrusted the investigation of the resources of the public domain, with the determination of the character of the public lands, and the valuation of those whose price is not specifically fixed by law; and upon the Reclamation Service has been laid the vitally important task of insuring the full utilization of arid lands by the construction of engineering works.

The duty of classifying the unentered public lands is now definitely accepted by the United States Geo-

logical Survey, and the opportunity neglected in 1879 has for several years been vigorously improved. The Department of the Interior fully recognizes that the land laws have not been and never can be efficiently administered in the absence of a detailed and authoritative classification of the land. Thus the Geological Survey is heartily co-operating with the General Land Office to the end that the best disposition of the land may be secured, and it should be noted that no small part of the data utilized in this work represents the fruitage of the earlier general investigations of the Survey. In this present-day task of land-classification the painstaking work of the Survey geologists and engineers in the last thirty years counts for much.

Utilization is the keynote of the present public land policy, and by utilization I mean not that kind of local development that exploits the present at the expense of the future, and is promoted by the land skinner, but rather a development whose plan weighs national needs and calculates future demands, and whose accomplishment will serve our country's advance in the next century as well as in the present decade. Utilization is opposed to both non-use and waste. To withhold the land from private use, except where public use is of greater advantage to the people, is to check national progress; to dispose of the people's land for other than its highest practical use is to waste that property and to betray the trust. The public land problem thus resolves itself into, first, the determination of the best use to which the public domain can be put, and second, the disposition of the land now belonging to the nation so as to assure that use. Such a land policy needs no defense, for it is based on the safe principle of the greatest good to the greatest number.

The classification of the public lands as now carried on by the Geological Survey under the direction of the Secretary of the Interior serves two important ends, one administrative, the other legislative, and I believe both were contemplated by Congress at the time of the creation of the Survey. Not only does land classification facilitate the work of fulfilling the requirements of existing law, but the classification of the public domain and the investigation of its resources furnish Congress with the data on which to base new legislation.

A notable example of land classification in aid of proposed legislation is afforded by the Acts of March and October 1888, wherein Congress directed that an irrigation survey should be made by the Geological Survey, and further provided that the reservoir sites and irrigable lands designated as a result of that investigation should be reserved from entry, settlement, or sale pending further legislation. The legislation of 1888 was itself the logical outcome of Major J. W. Powell's 1879 report on the arid lands, and his subsequent work as Director of the Geological Survey, and the law that eventually resulted from the work thus authorized in 1888 was the Reclamation Act of 1902. As another instance where thorough knowledge of the public domain, and particularly of the character of a special tract with its strategic relation to the hydrography of the region, enabled the Department of the Interior to aid Congress may be

*Read before the National Irrigation Congress, Spokane, August 10.

cited the Act of February 20 of this year, reserving for public use eight sections of waste land in southern California. The law provides that this land shall be used for the diversion of flood-waters into underground storage, thereby replenishing the supply of underground waters in the San Bernardino valley. While apparently of only local scope the principle established in this legislation is really of great importance as providing a line of action that will be found adaptable elsewhere in securing effective conservation of waste waters. Hydrographic and topographic surveys which are in progress at the present time under instructions of the Secretary of the Interior have as their purpose the collection of information that may be presented to Congress in aid of legislation looking toward the best utilization of the water-powers on the public domain.

Land classification in aid of the administration of the public lands is now actively presecuted by the Geological Survey, and reports setting forth in detail the mineral or non-mineral character of public lands are being transmitted to the General Land Office on the coal, oil, and phosphate lands of which the Geological Survey has made actual field examination. Another line of activity is the segregation of non-irrigable lands under the terms of the Enlarged Homestead Act of February 19 of the present year. The recommendations of the Geological Survey on which the Secretary of the Interior bases his designations have not of course depended on surveys made for this specific purpose, but represent the available data collected through a period of many years by Federal geologists and engineers. The existence of this information whereby, within these few months since the enactment of the law, the Secretary has been able to designate areas in nine States and Territories, aggregating 162,000,000 acres, is in itself a forceful argument for a land classification that is complete and authoritative.

The classification and valuation of the coal land is the special phase of public land work to which the Geological Survey is giving increasing attention. Since the Executive withdrawals of 1906 the coal-fields in the public land States have been the scene of Survey activity on a scale that could not have been possible in the earlier period when the appropriations were altogether inadequate. The purpose of these classification surveys is two-fold: to expedite the complete restoration to agricultural entry of land thus determined to be non-coal although included in the general withdrawals, and to promote the utilization of the coal lands which today represent the greatest natural resource to which the people retain an unquestioned title. The geologic investigations of the last three field seasons have not only furnished a knowledge of the quantity and quality of the coal on the public domain, but have rendered possible the present policy of obtaining coal prices for coal lands. The General Land Office now depends on the Geological Survey to furnish detailed valuations for every 40-acre tract of coal that is placed on the market.

The scale on which this work is being prosecuted is indicated by the record of the two and a half months following the adoption of the revised scheme

of valuation; in this period the reports to the General Land Office released to agricultural entry approximately two and a half million acres of non-coal land in Colorado, Wyoming, and Montana, and placed selling prices on nearly 400,000 acres of coal land with an aggregate valuation of over fifteen million dollars, which is an average advance of more than 100% over the minimum prices fixed by law. Under the regulations setting forth the plan of valuation of Government coal land the price is determined on the bases of estimated tonnage, and the unit rate varies with the quality of the coal, ranging within 15 miles of a railroad. The prices thus calculated for the public coal land average less than one-tenth the usual royalty paid in the West, yet this conservative valuation will more than double the average price of public coal lands, not to mention the fact that this policy of land classification has stopped the disposal of coal lands at even less than the minimum coal price. I might cite exceptional cases like one in Wyoming where the average price based on tonnage represents a fifteen-fold increase over the old minimum price. Sales are being made at the new prices and the reports from one land office already indicate a greater activity in coal lands priced at \$25 and \$50 per acre than existed a few years ago when they sold at the minimum price of \$10 and \$20.

It is conceded that this policy of basing the price on the quantity and quality of the article sold will discourage purchase by speculators, but I maintain that the Government valuation will not impede the disposition of the coal deposits for purposes of utilization. The real development of the West will be promoted, not retarded. The situation is clearly viewed by an editor of a Western mining journal who has recently stated that this increase in valuation "can produce but one result—the lands will be sold only as they are actually needed for mining purposes. This should reduce the danger of monopoly, without promoting over-production and wasteful competition. In the end it should give future generations cheaper coal. The unearned increment will go in part to the nation rather than to individuals." If a scientific classification and adequate valuation of the coal lands will accomplish all this—protection against monopoly, over-production and wasteful competition as well as the assurance of cheaper coal to the consumer and a larger return to the public—what more can be asked?

The popular view in regard to the disposition of the public lands is in my opinion in a state of transition. Not only is the speculator now given less consideration than the entryman who desires to use the land, but by reason of the operation of the Reclamation Act, the citizens of each State are beginning to take a personal interest in the receipts of the Land Office. It is hardly necessary in this connection to bring to your attention the fact that the increased valuation of the millions of acres of public coal land must result in increased contributions to the Reclamation Fund and greater possibilities for local utilization of the agricultural lands through irrigation.

In conclusion I would mention a principle that is winning increased recognition in land legislation—

namely, relative worth. The earliest land laws provided for the reservation of mineral lands from disposal for other purposes and the present coal-land law expresses this principle of relative worth by giving gold, silver, and copper deposits priority over the coal, and the coal in turn preference over agricultural values. These distinctions necessitate land classification based on adequate field examination, and with classification data at hand the principle of relative worth can be further developed. Wherever the different values conflict the higher used should prevail. For example, the reservation or disposal of a tract of land for a dam or reservoir site should have preference over its use for agriculture. On the other hand, wherever the different values can be separated, that separation by appropriate legislation is at once the easiest and best solution of the problem, for instance, the surface rights may be separated from the right to mine underlying beds of coal. The first step in this direction was taken in March of this year in the passage of the Mondell Act for the protection of the surface rights of entrymen, whereby the home-seeker may secure all of which he makes entry, all he swears he is getting, while the coal beneath his tillable land is reserved to the nation for future disposal.

The ideal land classification would be that based on field examination, scientific and detailed enough to include every natural resource; the ideal land legislation is that which fully recognizes the principle of relative worth; and the ideal land administration is that which will assure the reservation or the disposition of the land for its highest use.

RUBY MINES OF THE MOGOK VALLEY, BURMA.

There are four principal mines in the Mogok valley, according to E. A. Wakefield, United States Consul at Rangoon. In each of these, modern tools and machinery are used. In adjacent valleys the Burmans still prosecute their searches in the old way, digging and washing by hand labor, but often with astonishing results. The byon or ruby-bearing clay is extracted by the open-quarry method. The ruby-bearing clay is dug up, carried on trolleys to the steam-mill, washed, passed through the sieves, and examined for rubies and spinels. The byon stretches almost everywhere along the Mogok valley, and wherever this clay exists rubies are to be found.

Besides the pure ruby, spinels or balas rubies are found in large quantities at Mogok. Wherever the ruby is found the spinel is sure to be present. They are both crystals of alumina, but of different shapes. While the true ruby is pure corundum only, the spinel has a minute quantity of magnesium, which lessens its hardness one-fifth. Except in a few rare cases, the expert can readily distinguish between the two. At the mines the separation of the rubies from the spinels is made by the use of the dichroscope. The stone is placed in the instrument so that a ray of light passes through it and is polarized. The true ruby shows a pure red ray, while the spinel shows a slight tinge of blue with the red. There are a few really magnificent spinels in existence, the

first among them all being the great Agincourt ruby in the English crown.

Notwithstanding the fact that the mines in the Mogok valley have produced practically all the rubies of ancient and modern times, it is difficult to learn how long these mines have been in operation, as it was always the policy of the Burmese kings to keep them as mysterious and secluded as possible, but mines were in operation for a long time previous to 1600. Mogok shows abundant evidence of prosperity. At one mine alone about 1400 tons of byon are washed daily during the busiest seasons, with resulting prosperity to the population. At the present time, as the ruby market is stagnant, there are only 800 laborers employed. When the market is active as many as 2000 workmen are required, nearly all Burmans, who are really excellent workmen in this line. The town has good roads, an excellent water supply and drainage system, and is well policed. In short, Mogok is one of the healthiest and most prosperous towns in all Burma. As the town is situated on ground which contains rubies, the mining operations are gradually encroaching on the residential and business sections. Whenever a house or street of houses is destroyed to prepare the way for mining operations, better quarters are provided for the occupants at the other end of the town. Old Mogok is a doomed place, as there are rubies everywhere within its limits, and in a comparatively short time the entire town will have been removed to the new site.

Rubies are more precious than diamonds, and are practically indestructible except by fire. While a flawless diamond of one carat may be worth roughly about \$100, a perfect ruby of the same weight would be worth at least \$200. But the increase in value as the size increases is much greater in rubies than in diamonds. A diamond of 10 carats is worth perhaps \$4000, while a ruby of that weight may be worth any price up to \$70,000, which was the value placed on a unique stone exhibited at the Franco-British Exhibition in London last year. During the present stagnation in the ruby market prices have not been reduced, but are maintained at the regular figures, even though sales are at a minimum, especially for export. In Burma itself the market for gems is surprisingly large, with a very steady demand. As the Indian places his surplus cash in gold and silver ornaments, so the Burman is inclined to invest his savings in rubies and diamonds, which may be readily realized upon in time of financial stress. In 1904-5 the exports of rubies amounted to \$273,000, in 1905-6 to \$265,000, in 1906-7 to \$327,000, and in 1907-8 to only a little more than \$2000.

Chromite occurs in deposits of commercial importance in Pennsylvania, Maryland, North Carolina, Wyoming, and California, but almost the entire production has come from California, where the largest deposits occur in Shasta and San Luis Obispo counties. The Shasta county deposits are the only ones at present operated, the principal occurrences being on Shotgun creek, one mile from the Southern Pacific railroad, in the western part of the county. The ore occurs in lenticular beds, and carries about 44% of chromic oxide.

MINING IN OAXACA, MEXICO.

Written for the MINING AND SCIENTIFIC PRESS

By E. M. LAWTON.

It is generally admitted by mining men who are informed on Mexican mining possibilities that the two States directly to the southwest of Mexico City, namely, Oaxaca and Guerrero, are as rich in mineral resources, as any other section of the Mexican Republic. The State of Guerrero, however, is a country truly 'set up on edge', with its box-canyons and extremely rugged mountains, so that transportation difficulties detract much from its position as a mining region, though it is probably rich in minerals beyond the conception of those who are best informed.

The State of Oaxaca is much more fortunate in facilities for travel and transportation. Until the advent of the Mexican Southern railroad, some ten years ago, the city and mining camps of Oaxaca were distant many days' horseback ride from Puebla, the nearest railroad point, or had a 200-mile pack-haul to Vera Cruz, which was the port to which the early mining companies had to send their rich ores or bullion for shipment to England. So truly were the people of Oaxaca cut off from the outside world that the language spoken here today is noticeable for its colloquialisms or 'patois', differing enough from the Spanish of other parts of the Republic so that a Oaxaquenean may be known by his speech. In spite of its isolation, however, the early records of the pioneer companies make a wonderful showing of metals produced, all done by the crudest methods. A number of old *Haciendas de Beneficio* are still standing, inert and deserted, with the old wooden stamps and wooden overshot wheel fast falling into decay, monuments to the sturdy character of the early English and German pioneers.

The mineral zone of Oaxaca is principally embraced in a circle with a radius of about 50 miles, having the city of Oaxaca as the centre. The principal districts are those of Ejutla, Taviche, Ocotlán, Sierra Juarez, Magdalena, and Penoles. These are generally known locally by slightly different names. Others, a little more distant, not shown on the map, are El Parién, Totolapám, and Teojomulco.

The conditions in 1907 were such that the mines in general were over-capitalized and under-developed. Owners of mines and prospects alike had an exaggerated idea of the value of their properties, and many groups of claims of doubtful value were taken up, the general idea being that anything would furnish bait for the inexperienced investor. Needless to say, today the conditions are changed. Good prospects can be purchased or bonded for from one-half to one-tenth of their former estimated value, and many doubtful ones have reverted to the Government, for lack of funds with which to pay the taxes, or because so many really promising prospects, already titled, can be had for low figures. With the gradual return of prosperity, it is easy to see that a more conservative basis will exist for the new order of things. Heretofore there has been much talk of projected railroads. Now the Mexican Southern railroad has Oaxaca for its southern ter-

minus. It is an English corporation, accredited with the necessary backing. The company has lately purchased outright several embryo 'through lines', originally projected to the nearby camps, or to the coast, east and west, and the local street-car lines as well. The uncompleted road to Taviche, for instance, has been revived, and is under construction, so that trains will soon be running to that point. One of the desirable features of this development is that the local smelter company, now re-organized and making necessary preparations for an early start, is dependent first of all on the Taviche ores to furnish product for treatment.

In order to connect with the Taviche road at Ocotlán, the Mexican Southern also acquired the Oaxaca & Agrícola road running to a point beyond Zimitlán. The concession for this road extends to a point considerably farther south, and either that route or the Oaxaca & Orient, also bought by the Southern, and already operating as a tram-line some miles outside of the city, will be utilized for a through line to the coast or to connect with the Tehuantepec National, as soon as the necessity fully warrants the expenditure. Other railroad projects are spoken of as possibilities, notably that of the St. Louis Iron & Steel Co., which has for over two years been making surveys and preparations to connect Oaxaca with their extensive iron mines in Santiago Minas district on the Rio Verde.

There are, by actual count, over 150 American mining companies or individuals operating or owning separate properties in the nearby camps. These represent an actual investment, as near as can be estimated of \$10,000,000 U. S. currency. Nor does this include the English or other foreign enterprises whose capital makes up a very decent additional figure. Of late much interest has been awakened in the coal and oil prospects of the outlying districts. The Oaxaca Iron & Coal Co., of which the A. B. Adams Co. of Mexico City is the actual head, has had an extensive corps of American engineers in the vicinity of Tlaxiaco during the past year or more, absolutely proving the coal-beds of that region. This concern is projecting a railroad from Puebla by way of the property and then directly south to the Pacific. Veins as large as 20 ft. wide have been found, and examinations have been made by some of the eminent geologists of the United States.

Recently Usher Carson, of Kansas City and Oklahoma, in an interview, has acknowledged the leasing of a tract of some 50,000 acres, near the town of Jamiltepec, in this State, to the south of the city of Oaxaca, for oil purposes. Mr. Carson, from his operations in the Oklahoma fields, is no doubt fully justified in believing the oil lands of this State worthy of development. Returning to the real mining matters, however, the natural inquiry is, what showing is being made for the large amount of money invested? At the present time there are 18 mills actually erected within the confines of Oaxaca. Of these many have been installed, as is too often the case in new camps, before the mines had been sufficiently developed to warrant a treatment plant. The majority of these mills have been built for amalgamation and concentration only. Some of the most

successful have not been averaging a recovery of more than 50% of the assay value of the ore, and the tailing has muddied the streams for many miles below the plant. A few have cyanide equipment, and in some cases these have never been used. But in the new régime a marked difference exists, in that these same companies are seeking expert technical and practical men, who can and will see that such appliances are installed as will yield high percentage of recovery.

There are building at this time two or three mills, all combining the latest features of cyanide treatment. Four additional plants are either asking for bids, or have let contracts for construction. A custom mill of 100 tons daily capacity is in process of erection, though the work has been stopped for the present in order to secure tests by competent engineers as to the best treatment, which information was not secured in the earlier plans of the company. So, in all, there are more than 20 mills either built



Casa Blanca Escuadra Mine.

or soon to be completed, of from 10 to 100 tons daily capacity. No mention is made of numerous other companies contemplating the erection of plants, most of whom have their properties already developed up to a point that will justify such action.

Much has been said about the quality of the labor to be had in Mexico for mine operations. It is well known that the average mine laborer in Mexico, be he *peon* or *barretero* (common laborer or driller), is more or less an erratic individual. He usually has a strong penchant for holidays, religious or others; he too often likes his *mescal* or *aguardiente*. But there are many virtues about the mine laborer in Mexico. The question of an 8-hour day does not bother him. More often he will work 10 or 12 hours, utilizing time between blasts for his *tortillas* and *frijoles*. Work is mostly done under a contract system, where the contractor himself makes a hand, and sees to it that his assistants 'put in their best licks'. The writer has contracts running at the present time for tunnel-work in hard rock for \$18 per lineal metre. This, of course, includes all expenses other than managerial. The cost-sheet for the San Francisco mine in the Taviche district, where the working face is at present 275 metres from the tunnel-mouth, shows a total direct cost of \$22.30 per metre of advance. H. S. Denny, of the firm of Denny Bros., well known for their work in South Africa, in a

recent interview thus speaks of the mining industry in Mexico: "In considering the possibilities of the mining industry in Mexico, I can only say that I am pleased with the result of the observations thus far made. Whether we judge the country from the standpoint of its mineral distribution or from the variety of minerals to be found here, or from the richness of the ore deposits, or from the natural working facilities, Mexico can claim equality with any mining country of the world. From Sonora and Chihuahua on the north to Guerrero on the south, and from Vera Cruz on the east to Jalisco on the west, there exist records of mineral production of such variety and magnitude that no more eloquent testimony is needed to carry conviction to the mind of anyone interested. Then, too, it must be considered that the work thus far done has been accomplished in the face of great disadvantages, and with the absence of modern mining methods, hence it seems reasonable to assume that under improved con-



San Jose de Gracia Mine.

ditions the possibilities of the mining industry in this country will be enormous."

Platinum exports from Colombia in recent years are estimated as below by Viconte Parra R., director of the Bureau of Statistics, of Bogotá, who says that discrepancy in value may be explained by the fact that shippers do not always give the market prices in the invoices.

| Whither exported | Quantity lb. | | | Value | | |
|---------------------|-----------------|-------|-------|----------|-----------|---------|
| | 1905. | 1906. | 1907. | 1905. | 1906. | 1907. |
| United States .. | 300.4 | 326.5 | 20.5 | \$26,810 | \$74,815 | \$2,856 |
| Germany | 8.8 | ..... | ..... | 800 | ..... | ..... |
| France | 1,954.2 | 212.5 | ... | 52,429 | 42,744 | ..... |
| United Kingdom | 211.7 | 26.8 | ... | 3,049 | 4,660 | ..... |
| Total | 2,475.1 | 565.8 | 20.5 | \$83,088 | \$122,219 | \$2,856 |

There is great difficulty in making any forecasts of the probable future output of platinum from Colombia, not because the country is unexplored and unknown, as many reports state, for in the days of the Spanish régime the Chocó was thoroughly exploited for gold, and in recent times every stream has been visited wherever a canoe could be paddled. All the platinum-bearing rivers are known, and the position of the alluvial deposits fairly well ascertained. The difficulty arises from the fact that no organized or scientific attempt has yet been made to test the platinumiferous capabilities of the several districts

PLATINUM AND GOLD LOSSES IN DREDGING.

Written for the MINING AND SCIENTIFIC PRESS
By W. B. WINSTON.

Some time ago W. H. James, of the Vilorio Syndicate, Ltd., Oroville, California, made some tests to determine the amount of platinum in the gravel and the losses in platinum and gold from the tables of a Bucyrus 5-ft. dredge. To determine the amount of platinum in a certain area to be dredged a shaft was sunk and the gravel passed over a rocker to recover the gold content and to concentrate the heavy sand with which the platinum is mixed. The concentrate thus produced is shown as sample 'A' under date of June 10. A test of the tailing behind the dredge to determine the gold and platinum losses is tabulated as sample 'B' under date of June 14. This sample was obtained by uniformly sinking small pits to accessible depths at regular intervals over the exposed sand-area behind the dredge. The weight of this sample was 1800 lb., and as it is estimated that one-third of the total material passes through the 5/16-in. perforations in the screen-plates, this would represent 1.42 cu. yd., based on the weight of 3800 lb. of gravel per cu. yd. as previously determined. At the time this sample was taken the dredge was digging within 50 ft. of the shaft which produced sample 'A' concentrate. The total 'A' and 'B' concentrate was sent to A. A. Hanks, of San Francisco, for gold and platinum determinations, with the result as shown in the table below.

| | June 10. | June 14. |
|---|----------------|----------|
| | No. of sample. | |
| | A. | B. |
| Material handled, cu. yd..... | 8.2 | 1.42 |
| Weight of concentrate, lb..... | 9 | 1 1/4 |
| No. cu. yd. to one ton concentrate.... | 18.22 | 22.40 |
| Concentrate per month, tons..... | 37 | 30 |
| Value of concentrate per 2000 lb., gold. | trace | \$4.95 |
| Value of concentrate per 2000 lb., platinum at \$40 per oz..... | \$6.40 | \$8.80 |
| Losses per cu. yd., gold..... | trace | \$0.22 |
| Losses per cu. yd., platinum..... | \$0.35 | \$0.39 |

Comparing the result of the samples 'A' and 'B' the value per cubic yard of each in platinum compares favorably. The gold result of sample 'A' shows that only a trace of gold escaped from the rocker into the concentrate, while in sample 'B' the loss in gold from the dredge-table was only 0.22c. per cubic yard, or less than 2% of the value actually recovered during the test period.

A summary of sample 'B' would be as follows: approximate loss of concentrate per month in tons of 2000 lb., 30 tons; value of the concentrate per month in gold, \$148.50; value of the concentrate per month in platinum at \$40 per oz., \$264; total loss per month with platinum at \$40 per oz., \$412.50; total loss per month with platinum at \$20 per oz., \$280.50.

In order to recover the above concentrate, after the installation of suitable concentrators or jigs, which would cost approximately \$7000, it was estimated that additional labor and power would be necessary to care for the machines and product as follows: Two men at \$3 per day, or \$180 per month; 10 hp. to run the machines at \$6 per hp., or \$60 per month; making a total monthly cost, not including in-

cidental delays and repairs to the machine, of \$240. This monthly cost of \$240 would give a product of approximately 30 tons of concentrate at the dredge ready to be shipped for treatment and \$172.50 would be the available surplus to meet all subsequent charges and profit. This assumes the platinum to bring \$40 per oz., which is excessive. If the platinum sold at \$20 per oz. the surplus of \$172.50 would be reduced to \$40.50. The average price received for platinum from the Oroville district is from \$17 to \$20 per ounce. The proportion of platinum saved in dredging operations does not exceed 10% of the recovery.

Iron ore deposits in Brazil, according to George E. Anderson, Consul-General of the United States at Rio de Janeiro, are larger than currently estimated. The Brazilian Government has just transmitted a report, for the use of the International Geological Congress, which meets next year at Stockholm, containing the results of a survey sent out for the purpose of studying the deposits. Although the text of this report is withheld, pending the use to be made thereof by the authorities for whom it was prepared, enough has been made public to predict that it will startle the iron world and be the sensation of the Congress. The examination of the deposits in Minas Geraes discovered 52 outcroppings of ore which was from 60 to 75% pure iron, free from all impurities which might interfere with its proper smelting. Of these outcroppings the expert selected 9, of average size and quality, which he carefully surveyed and measured, calculating their contents at a little less than 1,000,000,000 tons of very high-grade ore, on or near the surface, and in situations permitting easy working and economical handling. On the basis of the surveys made, the 52 deposits contain a little less than 6,000,000,000 tons of the highest-grade ore. In addition, loose high-grade ore was found to an amount as large as that found in the outcrops, the total high-grade ore found thus amounting to 12,000,000,000 tons. As Brazil, for various reasons, will be unable to work these vast deposits, they have recently been visited by representatives of American and British syndicates, with a view to making contracts for ore shipments, in the immediate future, from Rio de Janeiro or from Victoria, about 300 miles north of Rio de Janeiro. The only result of these visits, as far as known, is the completion of a contract between a party of one of the British syndicates and the Victoria & Diamantina Railway Co. for ore shipments by way of Victoria.

Alabama is peculiarly favored in its ability to manufacture cheap iron, although the ores are not of so high a grade as those from Lake Superior, which feed the furnaces of the Northern States. Alabama's proportion of iron production is usually larger in years of depression than in flush times. This is illustrated by the statistics of pig-iron production in 1908, which show that Alabama's output was 17% less than in 1907, while in Illinois the percentage of decrease was 31; in Virginia, 33; in Pennsylvania, 38; in Ohio, 45; in Maryland and West Virginia, 65; and the average for the entire United States, 38.2.

COMPANY REPORTS.

CALUMET & HECLA.

The annual report of the Calumet & Hecla Mining Co. for the year ended April 30 is issued. Comparison of the balance sheet for four years is as follows:

| | | | | |
|---------------------------------|--------------|-------------|-------------|--------------|
| Assets: | 1909. | 1908. | 1907. | 1906. |
| Cash and copper.. | \$6,384,305* | \$4,685,422 | \$6,477,190 | \$7,953,251 |
| Notes, bills receivable | 406,000 | 650,017 | 1,281,768 | 1,140,121 |
| Insurance fund .. | 967,919 | 959,724 | 953,340 | 995,764 |
| Development and equipment fund. | 15,882 | 554 | 45,145 | 1,827,544 |
| Total | \$7,774,106 | \$6,295,719 | \$8,757,444 | \$11,916,691 |
| Liabilities: | | | | |
| Notes and bills payable | \$ 848,112 | \$1,337,737 | \$1,228,502 | \$ 408,862 |
| Drafts in transit. | 104,226 | ..... | ..... | ..... |
| Machinery contracted ..... | ..... | ..... | ..... | 878,000 |
| Note Keweenaw Association ..... | ..... | 250,000 | 500,000 | ..... |
| Employees' Aid Fund ..... | ..... | 7,017 | ..... | ..... |
| Total | \$ 952,338 | \$1,594,754 | \$1,728,502 | \$1,286,862 |
| Surplus | 6,821,768 | 4,700,964 | 7,028,942 | 10,629,819 |

*Copper taken at 13c., mineral at 7c.
Notes outstanding amounting to \$8,519,000 are as follows:

| Amount. | Rate, Percent. | Dated. | Maturity. |
|-------------|----------------|-------------------|-----------|
| \$1,700,000 | 5 | March 1, 1909 | 3 years |
| 1,000,000 | 5 | March 1, 1909 | 10 years |
| 1,685,000 | 5 | February 18, 1909 | 10 years |
| 4,134,000 | 4 | February 18, 1909 | 10 years |

The refined copper product of the company for recent years ending April 30 has been as follows (in pounds):

| | | | |
|-----------|------------|-----------|-------------|
| 1900..... | 98,624,789 | 1905..... | 85,644,401 |
| 1901..... | 72,653,332 | 1906..... | 101,031,799 |
| 1902..... | 79,964,066 | 1907..... | 93,898,963 |
| 1903..... | 76,632,912 | 1908..... | 78,980,000 |
| 1904..... | 76,620,145 | 1909..... | 82,816,230 |

The holdings of Calumet & Hecla in its subsidiary companies on April 30, 1909, compare with its holdings a year ago as follows:

| | Shares issued. | Owned by C. & H. Apr.30,'09. | Owned by C. & H. Apr.30,'08. |
|---------------------------|----------------|------------------------------|------------------------------|
| Allouez Mining Co..... | 100,000 | 42,978 | 42,978 |
| Centennial Con. Min. Co.. | 90,000 | 46,080 | 46,080 |
| Frontenac Copper Co..... | 20,000 | 20,000 | 20,000 |
| Gratiot Mining Co. | 100,000 | 50,100 | 50,100 |
| La Salle Copper Co..... | 302,977 | 160,050 | 160,050 |
| Manitou Mining Co..... | 20,000 | 18,000 | 18,000 |
| Osceola Con. Mining Co.. | 96,150 | 32,781 | 22,671 |
| Superior Copper Co. | 100,000 | 50,100 | 50,100 |
| Dana Copper Co. | 40,000 | 36,500 | 36,400 |
| St. Louis Copper Co..... | 40,000 | 35,450 | 35,450 |
| Laurium Mining Co. | 40,000 | 26,900 | 1,900 |
| Seneca Mining Co. | 20,000 | 11,207 | 891 |
| Isle Royale | 150,000 | 27,500 | ..... |
| Ahmeek | 50,000 | 24,796 | ..... |
| Tamarack | 60,000 | 19,400 | ..... |

President Agassiz says in part: During the past year the company produced mineral equal to 81,178,326 lb. of refined copper, against 86,528,009 lb. last year. The product of refined copper was 82,816,230 lb. In the year ending April 30, 1908, the product of refined copper was 78,980,466 lb. We have continued to take out the shaft-pillars of Hecla No. 2 and 3, and of South Hecla No. 11. At the seventy-third level under South Hecla shaft No. 9-10 there has been a marked change for the better in the quality of the conglomerate. Should this new shoot develop in length and depth, it will give us an important addition to our stoping ground. The electric hoist for the sub-shaft in the 'five forties' has been placed in position, and is now working satisfactorily. We have continued sinking all the shafts on the Osceola amygdaloid, and in the past year have opened 23,475 ft. of drifts, as compared to 19,820 ft. in 1907-8. The character of the openings is satisfactory. We began the work of opening the Osceola amygdaloid May 1, 1897, and stopped it November 1, 1901. During that time

we drove 66,860 ft. and five shafts were sunk to a total depth of 5455 ft. Work was resumed July 1, 1904, and up to the present time the total length of the drifts is 127,920 ft., and the total depth of six shafts 13,480 ft. The tonnage now opened is about 15,000,000. At a depth of 5000 ft. on the slope this lode has been found to carry fair quantities of copper in the Tamarack and deeper parts of our property. The product from this lode the past year was secured largely from openings which are now so extensive that we feel justified in increasing our stoping.

On the Kearsarge lode we have continued to sink No. 21 shaft and to drive, with moderate results. The percentage of copper in the conglomerate has continued to decrease. About 35 lb. is now saved per ton of rock. We stamped 1,952,541 tons of conglomerate, as compared to 1,894,176 tons in 1907-8. We stamped 747,378 tons of amygdaloid rock from the Osceola lode, yielding 12,722,226 lb. of copper, as against 603,891 tons, yielding 11,145,220 lb. in 1907-8. An addition has been made to the foundry, nearly doubling the floor space.

We have erected a power-line to the Lake Superior Water Works and have installed an electrically driven centrifugal pump of a capacity of 3,000,000 gal. daily, and are now sending water from these works to the mill-boilers at Torch lake. To regulate the flow a tank of a capacity of 750,000 gal. has been built near the mills. The re-grinding mill-building has been finished, and during the past year 24 of the Chilean mills have been installed; they are now running satisfactorily. We are extracting 4 lb. of copper from a ton of tailing, treated at a cost of about 5c. per lb. At present the production of the mill is about 1,000,000 lb. per year.

We are organizing the White Pine Copper Co. to develop the lands which carry the Nonesuch lode, to be conveyed to that company by the Keweenaw Association and others. We shall own about half the shares of this company at a cost of \$100,000 spent in exploration and on condition of advancing the money needed for its development. Acting under the authority given at the annual meeting of the stockholders on August 16, 1905, your directors have, at a cost of \$8,592,130, in notes and cash, purchased: 25,000 shares of Laurium Mining Co., 10,316 shares of Seneca Mining Co., 25,507 shares of Isle Royale Copper Co., 9600 shares of Osceola Consolidated Mining Co., 19,400 shares of Tamarack Mining Co., 24,796 shares of Ahmeek Mining Company.

Three mechanical drill sharpeners, with a capacity of 6000 drills per day, have been installed in the Calumet blacksmith shop and are working admirably. About 3400 drills per day are now being sharpened. The change of the gauge of our railroad to standard has been completed, with the exception of the tracks leading to three of the Osceola amygdaloid shafts, so that nearly all the rock is now run to the mills in large 40-ton cars fitted with modern brakes. Five locomotives have been re-modeled to standard gauge.

The production of all the mines in which the Calumet & Hecla Mining Co. holds stock is at present somewhat over 50,000,000 lb. of copper per annum. We hope that with a reasonable price for copper the returns from our holdings in the companies enumerated in the treasurer's report will, at least, be sufficient to pay the interest and the principal of the notes we have given, before the expiration of the 10 years during which they become due. The expenditures of the aid fund during the fiscal year amount to \$63,299. The value of the aid fund at cost is \$115,230.

ALASKA'S coal output for 1908, as reported to the United States Geological Survey, was 3107 tons, with a value of \$14,810, as compared with 10,139 tons in 1907, valued at \$53,000. Four mines were operated in 1907, but only three were productive in 1908. Of these, one was at Port Graham, Kenai peninsula (lignite); one at Chicnik, Alaska peninsula (bituminous); and one at Chicago creek, Seward Peninsula (lignite). In addition to the output of these mines, a few tons of coal were mined for domestic use at Tyonek, at several points on the Yukon, at Cape Lisburne, and at Wainwright inlet, in northern Alaska, where the Eskimos are utilizing a lignitic coal for fuel, in place of the fast disappearing driftwood.

Petroleum Production in 1908.

Final figures for 1908 collected by the United States Geological Survey show that the total production aggregated 179,572,479 bbl., valued at \$129,706,258, an increase in quantity of 8.11% over 1907. Oklahoma led all the States in production, with a total of 45,798,765 bbl., an increase of 5.23% over 1907; California was a close second, with 44,854,737 bbl., an increase of 22.85% over 1907; but Illinois gained the greatest percentage, rising from 24,281,973 bbl. in 1907 to 33,685,106 bbl. in 1908, a gain of 38.72. Colorado, Louisiana, Michigan, Missouri, Utah, Wyoming, and West Virginia also showed gains in production. The declines were in Indiana, where it was nearly 36%; in Kansas, 25; Ohio, 11; Texas, 9; Pennsylvania, nearly 6; New York, 4.3; and Kentucky and Tennessee, 11 per cent.

The average price of petroleum for the entire country in 1908 remained identical with that in 1907, but there were considerable variations of an important character in individual States. The most notable of these was the increase in price in California, from 37c. per bbl. in 1907 to 52¼c. in 1908. The Gulf States, Louisiana, and Texas showed a decline in value from a little over 80c. to 60c. The Appalachian oil showed a slight increase in value, from \$1.75 in 1907 to \$1.79 in 1908. On the whole, prices were remarkably steady, considering the notable increase over the large production of 1907.

In the following table are given the total quantity and value of crude petroleum produced in the United States during the years 1907 and 1908, by States:

| State. | Quantity, bbl. | Value. | Average price per bbl. |
|--------------------|-------------------|---------------|---------------------------|
| 1907. | | | |
| California | 39,748,375 | \$ 14,699,956 | \$0.370 |
| Colorado | 331,851 | 272,813 | 0.822 |
| Illinois | 24,281,973 | 16,432,947 | 0.677 |
| Indiana | 5,128,037 | 4,536,930 | 0.885 |
| Kansas | 2,409,521 | 965,134 | 0.401 |
| Kentucky | 320,844 | 862,396 | 1.051 |
| Tennessee | | | |
| Louisiana | 5,000,221 | 4,063,033 | 0.813 |
| Michigan | 4,000 | 6,500 | 1.625 |
| Missouri | | | |
| New York | 1,212,300 | 2,127,748 | 1.755 |
| Ohio | 12,207,448 | 14,769,888 | 1.210 |
| Oklahoma | 45,798,765 | 17,513,524 | 0.402 |
| Pennsylvania | 9,999,306 | 17,579,706 | 1.758 |
| Texas | 12,322,696 | 10,401,863 | 0.844 |
| Utah | 9,339 | 21,883 | 2.343 |
| Wyoming | | | |
| West Virginia | 9,095,296 | 15,852,428 | 1.743 |
| Total | 166,095,335 | \$120,106,749 | \$0.723 |
| 1908. | | | |
| California | 44,854,737 | \$ 23,433,502 | \$0.5225 |
| Colorado | 379,653 | 346,403 | 0.913 |
| Illinois | 33,685,106 | 22,648,881 | 0.672 |
| Indiana | 3,283,629 | 3,203,883 | 0.976 |
| Kansas | 1,801,781 | 746,695 | 0.414 |
| Kentucky | 727,767 | 706,811 | 0.971 |
| Tennessee | | | |
| Louisiana | 6,835,130 | 4,131,173 | 0.604 |
| Michigan | 15,246 | 22,345 | 1.466 |
| Missouri | | | |
| New York | 1,160,128 | 2,071,533 | 1.7856 |
| Ohio | 10,858,797 | 14,178,502 | 1.306 |
| Oklahoma | 45,798,765 | 17,694,843 | 0.386 |
| Pennsylvania | 9,424,325 | 16,881,194 | 1.7912 |
| Texas | 11,206,464 | 6,700,708 | 0.598 |
| Utah | 17,775 | 27,920 | 1.57 |
| Wyoming | | | |
| West Virginia | 9,523,176 | 16,911,865 | 1.776 |
| Total | 179,572,479 | \$129,706,258 | \$0.722 |

Commercial Paragraphs.

ATKINS, KROLL & Co., Kohl Bdg., San Francisco, California, announce that they have been joined by Mr. David Atkins and Mr. E. N. Atkins, formerly of DeGolia & Atkins, the business of which firm they have taken over. In addition to handling mining supplies, pebbles, chemicals, refractories, etc., they are now handling carbons and bortz for diamond-drills, and the new department embraces the purchase of the more uncommon ores of commercial importance, such as vanadium, tungsten, antimony, etc.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

THE TRANSIT. Published by the College of Applied Science, State University of Iowa. Pp. 127. Ill. Iowa City, 1909.

GYP SUM AND GYP SUM PRODUCTS IN 1908. By E. F. Burchard. U. S. Geol. Survey, Adv. Chapter, Mineral Resources for 1908. Pp. 10. Washington, 1909.

PRODUCTION OF FLUORSPAR AND CRYOLITE IN 1908. By E. F. Burchard. U. S. Geol. Survey, Adv. Chapter, Mineral Resources for 1908. Pp. 16. Washington, 1909.

PROGRESS OF THE MINERAL INDUSTRY OF TASMANIA. By W. H. Wallace. Pp. 13. Hobart, 1909.

Report for the quarter ending March 31, 1909.

INVESTIGATION OF THE PEAT BOGS AND PEAT INDUSTRY OF CANADA DURING 1908-9. By Erik Nyström and S. A. Anrep. Dept. Mines, Mines Branch, Bull. No. 1, pp. 25, Maps. Ottawa, 1909.

This paper includes detailed surveys of a number of the bogs, with results of drilling and analyses. The methods of preparing peat for the market are also discussed.

HISTORY OF THE CLAY-WORKING INDUSTRY IN THE UNITED STATES. By Heinrich Ries and Henry Leighton. 8vo., pp. 240, Index. John Wiley & Sons, New York, 1909. Price \$2.50

This is a portion of the economic history of the United States being prepared under the direction of the Carnegie Institution of Washington. It is the only book covering this field, and will be widely useful to students, both of ceramics and of economics.

TRANSVAAL CHAMBER OF MINES. NINETEENTH ANNUAL REPORT. 8vo., pp. 633. Johannesburg, 1909.

The report for 1908 follows the style of the earlier volumes and contains a large amount of valuable detailed information about labor, mining regulation, output, and every phase of mining on the Rand. Transvaal is to be congratulated on having so excellent a system of publicity.

INFORME SOBRE LA COSTA SUR DEL PERU. BOLETIN DEL CUERPO DE INGENIEROS DE MINAS DEL PERU, No. 70. By V. F. Marsters. Lima, Peru, 1909.

This volume of 112 pages is one of a number issued recently under the auspices of the Department of Fomento. It gives in considerable detail the geology of the Ica valley of the region east of Huayuri, of the Rio Grande, of the valley of Yauca, the surroundings of Arequipa, and the region east of Tambo, as well as other areas in the south of Perú. The volume is well gotten up, and is accompanied by many illustrations, maps, and cross-sections.

Catalogues Received.

The W. S. ROCKWELL Co. New York, in its new catalogue (No. 5) describes muffle furnaces for assaying.

THE HENDRIE & BOLTHOFF MFG. & SUPPLY Co., Denver, Colorado, under date of August 2, has issued its regular monthly announcement.

The STROMBERG-CARLSON TELEPHONE MFG. Co., Rochester, N. Y., in Pamphlet No. 18, shows its 5-line combination switching telephone and a 2-line switching device.

The CHAIN BELT Co., Milwaukee, Wis., has just published an elaborate and handsome catalogue giving complete data regarding its line of elevating, conveying, and concrete machinery.

The A. LESCHEN & SONS ROPE Co., St. Louis, Mo., is distributing an attractive folder giving excellent views showing the progress of construction of the Cathedral of St. John the Divine at New York.

The KEUFFEL & ESSER Co., New York, has just published a folder describing the new Log Duplex Slide Rule. This ingenious device is an improvement on the ordinary slide-rule by which problems involving involution and evolution and more easily solved.

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TABLE OF CONTENTS.

| | |
|---|-------|
| EDITORIAL: | Page. |
| Notes | 237 |
| Protective Tariff | 238 |
| Mascot Copper Company..... | 239 |
| GENERAL MINING NEWS..... | 241 |
| SPECIAL CORRESPONDENCE | 246 |
| CONCENTRATES | 251 |
| DISCUSSION: | |
| Theory of the Settlement of Slime..... | |
|Horace G. Nichols | 252 |
| Continuous Revolving Slime Filter..... | |
| Edward Parrish | 253 |
| Abbreviating Code Messages..... | |
| Mark R. Lamb | 253 |
| Slime Concentration..... | |
| Frank R. Porter | 253 |
| Co-operative Topographic Surveys..... | |
| Henry B. Kuemmel | 254 |
| ARTICLES: | |
| All-Sliming..... | |
| E. M. Hamilton | 255 |
| Fluorspar in Colorado..... | |
| Ernest F. Burchard | 258 |
| Saving Gold With Hungarian Riffles..... | |
| 261 | |
| Diamond Drilling at Tonopah..... | |
| John M. Fox | 262 |
| Weir Measurements | |
| 265 | |
| U. S. Geological Survey Field Work..... | |
| 267 | |
| Philippine Placer Mining | |
| 267 | |
| Electric-Driven Well-Driller..... | |
| J. Vale Downte | 269 |
| DECISIONS RELATING TO MINING..... | |
| 268 | |
| DEPARTMENTS: | |
| Personal | |
| 240 | |
| Market Reports | |
| 240 | |
| Company Reports | |
| 268 | |
| Publications Received | |
| 270 | |
| Commercial Paragraphs | |
| 270 | |

EDITORIAL.

FRiction between Mr. Gifford Pinchot and Mr. Richard A. Ballinger over the public-land policy is most embarrassing. The public is not certain how much it may grab or how much devastate; in fact, the present situation renders it quite impossible to decide on which gentleman it is wise to bestow the more deference.

Elimination of sulphuric anhydride from smelter fume by neutralization and filtering through raw-wool bags has been demonstrated to the satisfaction of Judge John A. Marshall, of the Federal Court in Utah, who has permitted the United States Smelting, Refining & Mining Company to resume the operation of its copper furnaces while this system is applied. Meanwhile the old war against the smelters in the vicinity of Redding, California, has been renewed. A Farmers' Protective Association has been organized at Olinda, and other districts are asked to join in the crusade. The so-called 'secret process' of the United States Smelting, Refining & Mining Company should be introduced at its Kennett smelter to absolve it from the condemnation of the community.

Telegraphic communication is constantly assuming greater importance in the conduct of business, despite the enormous rates which prevail in this country. These have continued practically unchanged for decades, while the cost of mail service has been decreasing. It is something of a shock to one used to the exorbitant rates for telegraphic despatches in the United States to cross the border into Mexico and find a telegraphic tariff in force that invites one to use the wire rather than write, seal, and stamp a letter. For a mere pittance messages may be sent into the wildest mountain districts, where the traffic is small and the cost of maintenance relatively high. As a means of escape from the trammels of high costs telegraphic codes have been developed to a high state of perfection, and recently the 'Miners' & Smelters' Telegraphic Code' has been elaborated for the special convenience of the mining world, supplementing the well known system of Bedford McNeill, permitting of the combination of two five-letter code-words into one. In another column we print an ingenious plan devised by Mr. Mark R. Lamb for applying the same principle to other codes. Since that was put in type an order has been issued by the sympathetic Western Union and Postal Telegraph companies, taking effect on September 1, which will require payment for two words on all code-words exceeding five letters in length when such words are not found in the English dictionaries. This ruling will provoke universal discontent, and will hasten the absorption of the telegraphic service as a function of the United States Post Office, or it will bring

about a strict regulation of these private corporations by Federal statute. The time has gone by for a corporation to embarrass communication by increasing rates rather than provide improved equipment to handle a larger volume of business on a reduced margin of profit. The mining industry is peculiarly affected by the new rates of the telegraph companies, since the mines lie chiefly in those zones where the highest tariffs apply. The question will undoubtedly receive consideration at the Mining Congress next month.

SLIME treatment is just beginning to receive scientific investigation. It is, perhaps, the most fertile field within the department of ore-milling open for study and experiment to the trained technologists of today. It has been our pleasure to advance the serious consideration of this subject, and further data will be published from time to time. This week appears among our 'Discussions' an interesting letter from Mr. Horace G. Nichols, who made an important discovery in slime-settlement which is now being practically applied. Mr. Nichols has tentatively submitted definitions of slime, considered with reference to concentration and to filtration in lixiviation processes that will undoubtedly call forth valuable comment, for no game awakens keener enthusiasm than the making of definitions. The point turns practically on the office of slime as affecting viscosity. Mr. Nichols raises the question whether "the force opposed to gravity be due more to viscosity of medium or to electro-static repulsion," affirming that "retardation of settlement clearly follows accumulation of concentration." On the other hand, we must point out that increased hydroxyl concentration retards the settlement of all negatively charged particles, at the same time decreasing the viscosity of the solution. The presence of colloids is not essential to this retardation of the settlement of negatively charged particles, but as the specific gravity of a solution is increased by dissolved colloidal substances in the sol form, settlement of suspended matter will be thereby hindered.

Protective Tariff.

Apology is poor remedy for failure to make honest downward revision of the tariff. President Taft signed the bill as the best that could be had. It is probably as good as can ever be produced under the present system. An unscientific method must perforce yield a product of disorder and injustice. The moment a tariff goes beyond the simple function of producing revenue and essays 'the encouragement of industry', it disturbs the normal balance of trade, and offers prosperity to some with corresponding hardship to others. The practical application of protection involves the promotion of certain industries, and necessarily fails to benefit all. This does not argue the principle to be wrong. The question is whether the gain is commensurate with the cost. As a cardinal point it is affirmed that no industry should be encouraged by a tariff which destroys some other. It seems wrong to take away one man's living while augmenting the riches of another. Perhaps it is wrong; but civilization is not gentle and beneficent

when it comes to the individual. It shares the icy indifference to the unit which is characteristic of biologic law. It looks to the welfare of the mass alone, prate and theorize as we may. Civilization as a process is not beautiful; it is the exterior result that awakens enthusiasm, that gives delight to those who are not ground under its merciless wheels. The tariff as constituted is in keeping with the human system of which it is but a part. It is the expression of the greed of the aggressive. It is framed for those who can fight hardest and can best use seductive persuasion to gain their ends. It does not offer a sop to the weakling; protection is for the strong, to make them stronger. Could there be a better illustration of the working of the law of the survival of the fittest? In other terms it is the survival of the successful.

But because a protective tariff is essentially a building up of something showing capacity for growth, for the assumed benefit of the people at large, no argument may be adduced from that in favor of the unscientific method employed. The spectacle of futile taking of evidence in Congressional committees regarding costs of production, the open trading of support between representatives of different districts with their corresponding interests, causes wonder that any approach to a reduction of duties may have been achieved. It is uncertain how far reduction of duties will take place by virtue of the Payne-Aldrich bill; but it is conceivable that a tariff commission could intelligently accomplish it if constituted with proper power to adjust the schedules under an established maximum. A beginning for such a reform was contemplated in the bill as originally drafted; as finally passed it grants the President power to appoint agents to "secure information to assist in the duties imposed upon him and information which will be useful to the officers of the Government in the administration of the customs laws." This is substantially the power he had possessed before for appointing special agents, but the new law enables him to appoint men of the highest talent, to continue them in service, and to pay them adequately. The President can, if he will, create a permanent body to acquire and publish information which will have an important educational value. It should reveal how adjustments to changing industrial conditions at home and abroad may be effected by a sliding scale under the direction of skilled specialists.

A remarkable 'rider' placed upon the Act is a provision for taxing corporations one per cent on all net income in excess of \$5000 per annum. It is, as Mr. J. Warren Keifer, of Ohio, showed, anomalous to combine a direct tax with a bill which primarily is intended to raise revenue by the indirect system. The basal mining law of the land, however, is only a 'rider' upon an Act for the right of way of ditches. Congress is all powerful within a few elastic Constitutional restrictions. That the corporation tax will prove injurious is commonly conceded. It will hit the insurance companies a severe blow and raise the rates; it will encourage consolidations under holding companies, which are exempt; it will stimulate the raising of capital and the absorption of earnings by

bond issues. Tax-dodging is a game of world-wide interest; the bull-movement of American stocks during the last six months is currently attributed to the tax-dodgers of Europe investing in American securities. One can but marvel at this feature being tacked upon the tariff, considering how inevitably it must fail of its avowed purpose. It will prove a most obnoxious part of the new law.

Signs of revolt against the Party leaders were shown in the refusal of seven Republican senators to record their votes in favor of the bill as it finally issued from conference. No such defection was ever witnessed before in connection with previous tariff legislation. It is said that these senators, headed by Mr. J. P. Dolliver, are now attempting to organize a faction with the avowed purpose of securing control of the Republican Party. This is inspired in the belief that the temper of the people presents the alternatives of schism or reform.

Mascot Copper Company.

Interest in the flotation of the Mascot Copper Company has become so keen as to demand a statement concerning its activities. The central offices of this company are in San Francisco, and its directors are scattered all the way from the Atlantic to the Pacific. Most of them are well known men, who stand high in their respective communities. The property of the corporation consists of 38 mining claims near Dos Cabezas, Arizona. The veins are said to vary from about 4 to 20 feet in width, and are claimed to average about 5 per cent copper, with gold and silver in variable amounts. Development to date aggregates about 7000 lineal feet, consisting chiefly of tunnels. The expenditure, of which this development is the visible fruit, is said to have been approximately \$300,000, or nearly \$43 per running foot. The equipment on the property consists of a small amount of machinery such as befits a mine in the early prospect stages, the most important being two Rand air-compressors. Some of the veins have been cross-cut about 500 feet below the outcrop. This is the deepest development. No driving has been done, and consequently no data have been obtained concerning probable available ore reserves below the carbonate zone. These statements are based upon data furnished by the assistant general manager for the company.

The Mascot Copper Company was incorporated under the laws of Arizona in July 1907, with an authorized capital stock of \$10,000,000, all of which was immediately issued to the Western Finance Company in payment for the properties and the improvements turned over. Stevens' 'Copper Handbook', for 1908, states that the "lands, circa 43 claims, including property formerly held by Dos Cabezas Consolidated Mines Company, (are) said to be held under bonds aggregating circa \$500,000." The Western Finance Company is the promoting concern, and is controlled by Messrs. T. N. McCauley, John A. Street, and E. A. Ealey. Mr. McCauley is the general manager for the Mascot company, and Mr. Ealey is resident superintendent at Dos Cabezas, Arizona. The Western Finance Company returned 250,000 shares of the Mascot stock to the

Mascot company with which to raise working capital. Of this quantity approximately 75,000 shares are reported to have been sold. Stock in the Mascot Copper Company was originally sold at \$3 per share; the price was arbitrarily advanced to \$4, and later to \$5. The methods of attracting attention have been of a spectacular character—an elaborate banquet at the Fairmont hotel, in San Francisco, another for the benefit of the merchants in Chinatown, palace-car parties to visit the mine, all magnanimously paid for by the corporation. These are the methods which have been generally identified with get-rich-quick schemes.

Evidence of the existence of large bodies of commercial ore has not been given to the public. Reports by Messrs. W. B. Tibby and John W. Gillingham, have been made but not printed for distribution. The accessible data from their reports appear to us inconclusive. A statement issued over the name of Mr. Gillingham gives a brief review of a few general geological characteristics of the immediate region, and continues, "The different veins, which I believe are fourteen in number, have to the mining engineer most favorable indications of mineralization and vein structure, and from the fact that these veins already disclosed by open-cuts and shallow shafts on the surface in so many places, and that the development work already done verifies the expectations aroused by surface indications, I would say in conclusion that from all the evidence at hand I believe the veins will be highly mineralized at depth, and that the mineral wealth at their intersection will be an immense profit to the fortunate owners." Such rambling comment is a vastly different thing from the careful and elaborate geological analysis which the world now expects as a preliminary to the opening of great mines, and it manifestly fails to answer the questions which a serious investor would ask. It is of the type of glittering generalities which are characteristic of boom reports and fake promotions. If the gentlemen promoting this concern have data warranting the outside public in assuming one-half the expense for 7½ per cent of the ownership of the property, those data have not been made public.

The president of the company is Mr. H. H. Evans, a politician of unsavory record in Illinois, one of the well known leaders of the 'Senate Combine' who was one of the promoters of the defunct International Mercantile Agency, with which Mr. Thomas N. McCauley was also identified. This association with a concern that ended in scandal, reflects strongly upon the new concern which is being promoted along lines which are so characteristic of those which are snares for the unwary.

How far it is worth while to warn investors is a question on which there is difference of opinion, but it does seem surprising that a corporation having no large measurable tonnage of ore developed can sell some \$300,000 worth of stock in a company of which 75 per cent of the shares, giving absolute control, remains in the hands of the promoters. If people wish to promote properties on that basis and others care to 'invest' money on such terms, there is no law to stop them, but it is not sound business.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

WILLIAM KNOX is at Igo, California.
 BERTRAM HUNT is in San Francisco.
 F. L. BOSQUI has left today for London.
 H. KILBURN SCOTT has left for Bulgaria.
 P. A. BABB, of Mexico City, is in Boston.
 C. H. NAZRO was visiting San Francisco.
 W. F. FERRIER is on a trip to San Francisco.
 FRANK H. PROBERT is at Houghton, Michigan.
 ELWYN W. STEBBINS is in Spokane, Washington.
 HENRY COLLENSON has gone to British Columbia.
 S. A. WORCESTER has returned to Victor, Colorado.
 C. F. NOURSE is at the Pilares mine, Sonora, Mexico.
 R. E. RAVEN has gone from Boundary, B. C., to Toronto.
 W. L. COBB will be at El Tino, Mexico, until September 1.
 C. D. WILKINSON has left Goldfield, Nevada, for New York.
 ERIC H. A. NORDIN, of Sacramento, was in San Francisco.
 H. FOSTER BAIN is visiting Denver and other Colorado points.
 H. A. SHIPMAN is in London from the West Coast of Africa.

MARCUS C. H. LITTLE, of London, England, is at Cobalt, Canada.

ANDREW WALZ has accepted a position at the Planet mine, Planet, Arizona.

SELWYN GOLDSTEIN is examining mines in Guerrero, Mexico, for English clients.

H. C. CUTLER has returned to Goldfield, Nevada, from Grass Valley, California.

W. H. HERDSMAN left London, August 6, for Nova Scotia to examine iron deposits.

E. L. OLIVER, superintendent of the North Star cyanide plant, is visiting Oakland.

R. C. RUCKER is at Durham, California, on leave of absence from Zaruma, Ecuador.

J. PARKE CHANNING returned to New York from Europe last week on the S. S. *Cleveland*.

R. H. BURROWS is now with the Moctezuma Copper Co. at Pilares de Nacozari, Sonora, Mexico.

HENRY LANCASTER, of Wallace, Idaho, has been on professional business at Murray, in that State.

W. S. NOYES has gone to Denver from Chicago. He will return to San Francisco about August 28.

NORMAN CARMICHAEL has been appointed general manager for the Arizona Copper Co., Clifton, Arizona.

L. S. AUSTIN is at Seattle, and will return to Houghton, Michigan, by way of Portland, Salt Lake, and Denver.

JAMES H. HOWARD, general manager for the Amparo Mining Co. of Etzatlán, Jalisco, Mexico, is in Philadelphia.

J. E. SPURR has finished an examination of the properties of the Ray Consolidated Copper Co. at Kelvin, Arizona.

LAWRENCE B. ADAMS, manager for the Guanajuato Amalgamated Gold Mines Co., La Luz, Mexico, is in Europe.

WALTER W. WISHON, manager of the Octave mine, Wickenburg, Arizona, is examining mines in Yavapai county, that Territory.

HERMAN A. PROSSER has associated himself with ARTHUR L. WALKER in partnership. They have opened engineering offices at 42 Broadway, New York.

G. H. GARREY, J. VOLNEY LEWIS, MARDEN W. HAYWARD, and W. H. GRANT are making an examination of the Cla. Minera de Peñoles properties at Ojuela, Durango, for Spurr & Cox.

A. C. LUDLUM, J. F. MCKENZIE, WILLIAM MARSHALL, A. N. WORTHINGTON, G. R. E. KENNEDY, and K. E. KENNEDY have been visiting the properties of the Compton Gold Dredging Co., in eastern Quebec.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, August 19.

| | | | |
|---------------------------|------------|------------------------|-------------|
| Antimony | 12-12½c | Quicksilver (flask) .. | 43.50-44.50 |
| Electrolytic Copper | 15½-16½c | Spelter | 6½-7½c |
| Pig Lead | 4.65-5.60c | Tin | 32-33½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|----------------------|-------|----------|-----------------|
| Aug. 13..... | 13.12 | 4.37 | 5.72 | 51½ |
| " 14..... | 13.12 | 4.40 | 5.75 | 51½ |
| " 15..... | Sunday. No market. | | | |
| " 16..... | 13.12 | 4.40 | 5.77 | 51½ |
| " 17..... | 13.06 | 4.40 | 5.80 | 51½ |
| " 18..... | 13.06 | 4.40 | 5.80 | 51 |
| " 19..... | 13.06 | 4.40 | 5.80 | 50¾ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Aug. 12. | Aug. 19. |
|------------------------|---------------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 5 0 ex div. | 1 5 9 |
| El Oro..... | 1 5 6 | 1 5 9 |
| Esperanza..... | 2 16 10½ | 2 18 9 |
| Dolores..... | 1 10 0 | 1 10 0 |
| Oroville Dredging..... | 0 12 8 | 0 12 8 |
| Mexico Mines..... | 6 10 0 | 6 10 0 |
| Tomboy..... | 1 1 8 | 1 1 8 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

| | Closing Prices. | |
|--------------------------------------|-----------------|----------|
| | Aug. 12. | Aug. 19. |
| Amalgamated Copper..... | 88 | 84½ |
| American Smelting & Refining Co..... | 103½ | 99½ |
| Boston Copper..... | 16½ | 16½ |
| Butte Coalition..... | 26½ | 25¼ |
| Cumberland-Ely..... | 7¾ | 7¼ |
| Dolores..... | 6¼ | 6 |
| El Rayo..... | 2 | 2½ |
| Giroux..... | 10 | 10 |
| Greene-Cananea..... | 10 | 9½ |
| Indiana Sonora..... | 3¼ | 3 |
| La Rose..... | 8 | 8½ |
| Miami Copper..... | 16½ | 16 |
| Nevada Consolidated..... | 24¼ | 23¾ |
| Newhouse..... | 3¾ | 3¾ |
| Nipissing..... | 10½ | 10½ |
| Ohio Copper..... | 5¾ | 4¾ |
| Tennessee Copper..... | 39¾ | 38¾ |
| Utah Copper..... | 53½ | 50¾ |
| Yukon..... | 5¾ | 4¾ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

| Closing Prices. | Closing Prices. |
|---------------------------|-----------------|
| August 19. | August 19. |
| Adventure..... | 7 |
| Allouez..... | 45¼ |
| Atlantic..... | 10½ |
| Calumet & Arizona..... | 104 |
| Calumet & Hecla..... | 680 |
| Centennial..... | 24¼ |
| Copper Range..... | 81¾ |
| Daly-West..... | 8¾ |
| Franklin..... | 16 |
| Granby..... | 100 |
| Greene-Cananea, ctf..... | 9½ |
| Isle Royale..... | 27 |
| La Salle..... | 14¼ |
| Mass..... | 7¾ |
| Mohawk..... | 63 |
| North Butte..... | 56 |
| Old Dominion..... | 55½ |
| Osceola..... | 144 |
| Parrot..... | 32½ |
| Santa Fe..... | 2½ |
| Shannon..... | 15¾ |
| Superior & Pittsburg..... | 16¾ |
| Tamarack..... | 68 |
| Trinity..... | 13 |
| Utah Con..... | 44¼ |
| Victoria..... | 4 |
| Winona..... | 6 |
| Wolverine..... | 155 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, August 19.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 16 | Mayflower..... | \$ 14 |
| Belmont..... | 89 | Midway..... | 22 |
| Booth..... | 14 | Montana Tonopah..... | 81 |
| Columbia Mtn..... | 9 | Nevada Hills..... | 75 |
| Combination Fraction..... | 66 | Ophir (Comstock)..... | 1.35 |
| Daisy..... | 24 | Pittsburg Silver Peak..... | 80 |
| Fairview Eagle..... | 15 | Rawhide Coalition..... | 22 |
| Florence..... | 3.05 | Rawhide Queen..... | 25 |
| Goldfield Con..... | 6.80 | Round Mountain..... | 70 |
| Gold Kewenas..... | 11 | Sandstorm..... | 9 |
| Great Bend..... | 8 | Silver Pick..... | 18 |
| Jim Butler..... | 11 | St. Ives..... | 9 |
| Jumbo Extension..... | 21 | Tonopah Extension..... | 62 |
| Llanos Con..... | — | Tonopah of Nevada..... | 7 15 |
| MacNamara..... | 34 | West End..... | 31 |

General Mining News.

ARIZONA.

COCHISE COUNTY.

The Arizona United Mining Co. expects to complete its 125-ton smelter at Johnson in the early part of November. The company has placed orders for a large amount of supplies and coke, and has let contracts to have them hauled from Dragoon to the mine. The contract calls for the delivery of 25 tons of coke per day at the smelter. William Robinson is superintendent.—W. F. Staunton, manager for the Tombstone Consolidated Mines Co., was in Tombstone recently to arrange for the purchase of a large compressor plant. At the mine ore is being taken from the 700 and 800-ft. levels and two or three carloads of concentrate shipped per week.—Charles Purdon and James Hart, of Tombstone, have bonded the Abril-Herrera group in the Dragoon mountains for Colorado capitalists. There are six claims in the group, and several small bodies of oxide and carbonate ore have been opened by surface cuts. The option runs for two years and calls for a \$30,000 payment if taken up at the end of that time.

GILA COUNTY.

The shaft of the Arizona-Michigan is down 500 ft. and cross-cuts started north and south from that point. The management expects to tap the orebodies found in the upper levels in 100 ft. with the south cross-cut, and in 300 ft. with the north. N. A. Nelson is superintendent.—The National Mining Exploration Co. has completed the installation of a compressor with a capacity of 800 cu. ft. per minute at the Williams shaft, which is now down 110 ft. The Fumarole mine of the same company is closed down temporarily for the installation of new machinery. F. A. Woodward is manager.

GRAHAM COUNTY.

J. Blackstein, of Clifton, has secured a three years option on the Gold Belt property and will erect a 20-ton reduction plant at the mine. There is a large amount of \$7 ore blocked out in the mine, with occasional streaks of high-grade.

MARICOPA COUNTY.

In a report on the Vulture mine, 15 miles south of Wickensburg, the management states that the mine has been completely unwatered and cross-cutting started on the 600-ft. level. On the 400 and 500-ft. levels the drifts have been re-timbered and ore is being blocked out for stoping. In the mill 20 stamps have been put in running order and will be kept dropping on ore from the development work. A. R. Mackay is manager.

MOHAVE COUNTY.

The Crowell mines on Wright creek have been bonded and will be prospected by diamond-drilling.—A contract has been let to sink the Treasure Hill shaft 100 ft. from the 140-ft. point.—At the Horseshoe mine west of Cerbat a contract has been let to sink the shaft 300 ft. deeper and drive 700 ft. of drifts and cross-cuts.

CALIFORNIA.

CALAVERAS COUNTY.

It is understood that W. G. Hammond and associates of Butte county have made arrangements with the Hayward and Hobart heirs and C. D. Lane to take over the Utica mine at Angels Camp, together with the holdings of the Union Water and Angels Light & Power companies.

ELDORADO COUNTY.

(Special Correspondence).—At the Gold Crown an 8-ft. vein assaying from \$8 to \$12 per ton has been opened.—The Landecker has resumed operations with a small crew of men. It is expected to start the mill within a few days. Howard C. Plummer is superintendent.—It is reported that the Larkin and Alderson mines will be re-opened under the management of Charles H. Dunton. The Alderson will be worked through a cross-cut from the Larkin.—Phillip Hickey is arranging for active work at a number of claims on the Hickey ranch.—The Boden gravel de-

posits on the Boden ranch have been purchased by J. E. Johnson. A hydraulic mine permit has been requested from the Débris Commissioners.—A number of properties in the Shingle Springs district are active, with a good production maintained.

Placerville, August 16.

At the Mt. Pleasant mine near Grizzly Flats the water has been lowered to the 500-ft. level. The development work is at present confined to the 300-ft. level, but cross-cuts from the shaft will be started to the vein when it is drained to the 600-ft. point.—On a test lot of ore from the Morey mine the average return was over \$100 per ton.—Operations are to be resumed at the Martin mine this fall.

INYO COUNTY.

At the Cerro Gordo mine of the Four Metals company new buckets are being added to the aerial tram to handle the increased output. About 300 tons of ore averaging 52% lead and 50 oz. silver are stored at Keeler till the smelter shall resume operations. There are also 1400 tons of slag running 13% lead and 10 oz. silver ready for treatment.—The Inyo Mines Syndicate is sinking two shafts on its property at Hummer, seven miles west of Olancho. W. G. Scott is in charge of the work.

NEVADA COUNTY.

The Idaho-Maryland is stoping on the 500 and 600-ft. levels. Some excellent ore is being opened at both places. The raise from the 1200-ft. level of the Mountaineer for the new shaft is up over 50 ft.—Fred Clarke, of San Francisco, has bonded the Twin Sisters mine near Snow Point. Two adits have cut the vein, which is on a slate-serpentine contact near the surface, and a lower adit has been started that will give 500 ft. of backs. George Hegarty is in charge of the work.

SAN BERNARDINO COUNTY.

The raise which recently opened phenomenally rich ore on the Oro lease of the Big Chief ground continues in a body of good milling ore, with occasional streaks of high-grade.—The north drift on the Oro Belle is now in nearly 400 ft. with good ore the entire length. On the 100-ft. level the cross-cut is expected to cut the vein within the next few weeks.—Work has been resumed on the Oro Belle Extension No. 1 claim. The ore so far opened is of milling grade, but will not pay to ship outside the district.

SHASTA COUNTY.

H. F. Musser, manager for the Western Exploration Co., brought nine gold-bricks, valued at \$13,400, to Redding as the result of the July run.—The home of Marlon M. Beckwith, superintendent of the Quartz Hill mine, was completely destroyed by fire. The loss amounted to \$2500.—M. Russell sold his interest in the Mother Lode group of claims west of Redding to Los Angeles capitalists.—An organization known as 'The Farmers' Protective Association' has been formed at Olanda to compel the smelters to pay damages for the supposed injury.—The Noble Electric Steel Co. shipped 20 tons of pig iron to the foundries at Redding from its plant at Heroult. The iron is of an excellent grade for foundry purposes. The Northern California Power Co., which is closely allied with the Steel company, has turned on the water to generate 5000 hp. at its new hydro-electric plant near Manton.

SIERRA COUNTY.

R. H. Chase has succeeded W. L. Stevenson as manager for the syndicate that was recently formed to operate the Gold Canyon, Happy Jack, Happy Jack Extension, Steamboat, St. Elmo, Townsend, Golden Crown, Golden Crown Extension, and Gold King claims. There is a 10-stamp mill on the Gold King property which is credited with a production of \$45,000.—Contracts have been let to drive the adit at the Eureka claim at Forest 100 ft., and that at the Bixby 125 ft.—At the Slattery gravel claims the old adits and raises are being cleaned out and re-timbered. H. Eckart is in charge of the work.—C. M. McMeekin is to succeed Mason W. Mather as manager of the Plumbago mines early in September. Mr. Mather will still continue as vice-president of the company.—In cleaning out the old adit at

the Slate Castle-Jaffa mine a 6-ft. vein of good looking ore has been opened.—The Arnold brothers, of Goldfield, have bonded the Ramshorn, First Chance, and Forest claims and started an adit to open the vein at a depth of 300 ft. A number of good assays have been obtained from a surface sampling of the vein.—The adit at the Eastern Cross near Alleghany has cut the ore-shoot at a depth of 50 ft.—James E. Deal has opened some excellent gravel on his group in Clark's canyon.

SISKIYOU COUNTY.

The clean-up of a 29 days run of the 2-stamp mill recently installed by the Elk Creek Mining Co. at the Colburn mine amounted to \$3300.—An 80-ton lot of ore from the Last of the Mohicans mine near Fort Jones milled over \$20 per ton. James Morrison is in charge of the work.

TUOLUMNE COUNTY.

Wayland Avery, the representative of the Providence Consolidated Gold Mining Co. of New York City, owner of the Providence and Consuelo mines at Tuolumne, is now visiting the properties. Mr. Avery is to be on the ground several months, and it is understood the company would consider a favorable offer for its holdings.—The Karmac Mining Co. is installing a new surface plant at its property above Jamestown.—Plans are under way for the resumption of work at the Clio and Tarantula mines. T. C. Crawford is manager.—The Yrma Gold Mining Co. has been organized at Jamestown to conduct a general mining business. The first effort of the company will be directed to the Josephine mine near Algerine.

YOLO COUNTY.

C. Perkins has filed an action at Woodland to recover damages in the sum of \$15,600 from the Bay & River Dredging Co., alleging that the defendant company, in 1908, dredged through a levee of a farm adjoining his in order to get onto land that was to be reclaimed, and that the gap in the levee was not closed, allowing his land to be flooded last January, leaving deposits of sand, washing out roads, and starting a troublesome growth of willows.

COLORADO.

PUEBLO COUNTY.

Over 500 men are idle as the result of the strike of the furnace-men at the zinc plant of the American Smelting & Refining Co. at Pueblo. The strike is on account of the refusal of the company to grant the scale of wages in force two years ago, which was an advance of 25c. per day over the present rate. The plant is under the guard of armed deputies.

SAN JUAN COUNTY.

The Allerton Mining Co., operating the Joe and John group, shipped four cars of ore to the Durango smelter. This ore was taken from the upper workings, but the company has driven an adit 500 ft. to cut the vein at depth, and hopes to open a series of lower levels in a short time.

TELLER COUNTY.

The annual report of the Mary McKinney Mining Co. shows a profit for the year of \$67,827.—The return on a two-car shipment from the Shurtloff mine was \$84 per ton.—The Elkton Consolidated Mining Co. has declared its regular bi-monthly dividend of \$37,000, payable August 24.—The shaft on the Buckhorn claim on Carbonate hill has been completed to a depth of 208 ft. and cross-cuts started to the vein.—A raise has been started from the fourth level of the El Paso mine for a new working shaft. John Nichols is superintendent.

IDAHO.

IDAHO COUNTY.

Operations are to be resumed at the Graham-Ross property near Newsome. This mine has been idle for the past two years.—A 350-ft. adit with a 50-ft. cross-cut has been driven on the Mackey property. A 20-ft. vein has been opened on the surface, from which good assays have been obtained.—Considerable work is being done at the Leggett Creek placer claims this season. James Surridge has a force of men working on a 175-ft. bank.—At the Little

Butte property of George Widmeyer, over 1000 ft. of development work on the vein has been done at a depth of 250 ft., and a large tonnage of ore that assays over \$14 per ton stored on the dump.—A trail is being constructed by the forest rangers from the Elk City-Orogrande wagon-road that will furnish a winter route to the Four Mile district.—The Penn-Dixie Mining Co. has cut another ore-shoot in its No. 3 adit. The company has now 2400 ft. of development work on the vein and a large tonnage of ore on the dump. William L. Sendker, the superintendent, is authority for the statement that the company will erect a mill at the mine in the near future.—A 500-ft. shaft is to be sunk on the North Star property.

NEZ PERCE COUNTY.

The Idaho Mining Co., operating in the Pierce City district, is completing a second dredge for the high placers adjoining the town of Pierce, and it expects to begin operations in a short time. This property was acquired four years ago and the first dredge was placed in operation in 1907.—The Bunker Hill & Sullivan Mining & Smelting Co. has purchased the Black Lead property in the Lolo Pass district of the Bitter Root mountains from L. F. Williams. Considerable development work has been done on the property and some high-grade copper ore opened. The price was \$50,000.

OWYHEE COUNTY.

A force of men has been started on the Big Sugar Loaf property.—The 950-ft. adit at the property of Michael Rock, adjoining the Big Sugar Loaf, is being driven ahead to tap the second vein. An average assay of the 12-ft. vein first opened was \$4.50 per ton.—New machinery has been installed at the property of the Wennersten Mining Co. and arrangements made with the power company to furnish electricity.—A boarding house and surface plant is being erected at the Noble mine. Angus McDonald is in charge of the work.

SHOSHONE COUNTY.

Work is to be resumed at the Old War Eagle group on Placer creek in the early part of September. Some \$30,000 has been spent on the property and \$20,000 more has been raised to continue the work. Charles F. Ruddy is manager.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—Eastern capitalists have leased 100 acres of the Murphy land at Galena and are preparing to sink a shaft on the property.—A part of the Clermont land has been leased and the lessees have placed a drill on the property to prospect it. The Clermont company has secured the High Tariff mill and is moving it to its property.—A new air-compressor and sludge tables have been added to the equipment of the Childress mill. The company is working in a disseminated ore.—The Charlotte Mining Co. has opened a rich deposit on the Matthews land and is repairing the old mill on that property.—The Gerster Mining Co. has been adding new equipment to the Southside mill.—The W. P. Clements mill is being repaired and a number of properties in that neighborhood reopened.—The Lehigh Circle Mining Co. has sunk 3 drill-holes which have cut some zinc and 70 ft. of ground containing lead ore. This land has been but slightly worked as there is a heavy flow of water there.

Galena, August 16.

MICHIGAN.

The results obtained in the experimental test of Superior ore at the Calumet mill have not been publicly announced but from unofficial sources it is learned that a very much better extraction was made by the method there in use and that the recovery was about 7 lb. mineral, the equivalent of 3 lb. refined copper greater than that obtained in the Atlantic mill. A proper readjustment of the milling machinery in the Atlantic mill with particular attention given the wash department is now being made.—The Quincy Mining Co. is planning an increased output to keep the stamps recently installed working to their full capacity.

MISSOURI.**JASPER COUNTY.**

(Special Correspondence).—The Holdout Mining Co. has just started the new 250-ton mill on the Guinn land near the Incline and Osceola.—Four properties have just been started in the Duenweg district.—The Ave Maria Co., south of Webb City, is taking up a 10-ft. stope of rich ore in the drifts.—Gallagher & Cerke on the Taylor & Glover land west of Joplin have opened up an old shaft where ore occurs at 117 ft. Drifts have been started. There are 14 drill-holes on the lease, put down several years ago before the water in the camp could be easily handled. This difficulty no longer exists as a number of companies are pumping in the vicinity.—On the Shifferdecker land another good find has been made by the Angora Cat Co., in the second hole sunk on the ground. The ore is found from 162 to 177 ft. and from 185 to 201. This company has cleaned out an old shaft from which drifts are being run to the new discovery.—The Hercules mill on the Luke & Ash ground now under construction will be the largest in the Joplin camp with a capacity of 500 tons per day.

Joplin, August 16.

NEWTON COUNTY.

(Special Correspondence).—The Halloween and Sunrise, two new plants in the Spring City camp, began operation last week. Several drill-holes are on the Halloween lease and the shaft has cut ore at 100 ft. The Sunrise is a new plant built to replace the one burned this spring and is an improvement over the former mill.—The Microbe is another new plant recently finished in the Spring City camp. Ore is found here at 100 ft. in a rich blanket formation.—The old No. 1 mill at Roaring Springs has recently been leased and is now used to treat tailing. Two concentrating tables have been added to the regular equipment.—The Watauga Mining Co. has recently erected a plant at Roaring Springs upon a lease with a promising orebody. Before the mill was built the ore was cleaned on hand-jigs with good results. The ore is free and consists of galena and zinc-blende, the galena being found in large chunks as well as in the fine crushed particles.

Spring City, August 17.

MONTANA.**FLATHEAD COUNTY.**

The Brick and Brannagan mine at West Fisher, 35 miles southeast of Libby, has been sold for \$125,000 to the Fisher Creek Mining & Smelting Co. The sale involved a cash payment of \$2500 with others to follow at stated intervals. There is a 10-stamp mill on the property which is credited with a past production of \$85,000.

NEVADA.**CLARK COUNTY.**

A station has been cut at the 300-ft. level of the Princess claim of the Spokane-Searchlight company and a small hoist installed at the surface of the shaft. Cross-cuts will be run into the hanging and foot-walls and drifts run on the vein from the 300-ft. level. Richard Lloyd is superintendent.—A gasoline hoist and new head-frame has been installed at the Duplex-Contact property at Searchlight. An engine-house and blacksmith shop have also been completed. The shaft is now down 100 ft. and cross-cuts will be driven to the vein.—The Quintette Mining Co. has started a drift on its property that will give 250 ft. of backs.

ESMERALDA COUNTY.

From the 430-ft. level of the Collins shaft at Luckyboy both east and west cross-cuts have opened bodies of shipping ore.

HUMBOLDT COUNTY.

The National mine at National continues to ship high-grade ore of sensational value. Some of the ore taken out of the high-grade streaks assayed \$70 per pound. In the Combination adit the Stall brothers have opened five shoots of ore.

LINCOLN COUNTY.

(Special Correspondence).—It is reported that the shaft

at the Quartette will be sunk to the 1500-ft. level at an early date. A large body of shipping ore is being opened on the 1100-ft. level. Steady shipments are maintained to the Selby smelter.—Sinking has been resumed at the Portland. The shaft is down 100 ft.—The Parallel company is to sink below water-level and is arranging for the installation of a pump. A considerable quantity of good ore is blocked out in the upper levels.—The Homestead has granted two leases.—At the Trio mine copper ore and ruby silver are being opened.—On the Chester lease at Crescent a streak of ore running \$300 per ton has been intersected in the 4-ft. vein.—Several important discoveries have been recently made in the Crescent district, and a large number of leases are working.

Searchlight, August 12.

NYE COUNTY.

The Bath lease at Manhattan opened a 2-in. streak of high-grade ore on the 30-ft. level. The drift has been run 16 ft. on the vein, which assays \$175 per ton.—The Aurora-Bullfrog Mining Co. at Springdale is planning the erection of a 200-ton mill on its property. The company has a large amount of \$9 ore opened and will sink another 100 ft. Joseph Murphy is superintendent.—A number of prospects at George's canyon are opening veins of ore, surface samples from which have assayed high. On the Tonopah Drug Co.'s group a number of assays have been made on surface material that go over \$100 per ton.—On a 25-ton shipment from the Gillespie lease on the Jim Butler ground at Tonopah the net return was \$412. The ore was taken from the dump, which would not pay shipping expenses when mined six years ago, and was treated in the Belmont mill at Miller. There is considerable more ore of this grade on the dump and the lessees are opening a 6-in. vein at the bottom of the 150-ft. shaft that assays \$100 per ton.

WHITE PINE COUNTY.

In a 106-ft. winze from the No. 1 adit the Hulse Leasing Co. opened a body of carbonate ore that assays 40% lead and 20 oz. silver per ton. The discovery was made on the Ontario claim of the Ely Hidden Treasure Co. A lower adit is being driven toward the orebody.—Five tons of 30% copper ore has been sacked for shipment on the Johnson lease on the Ely-Calumet property.

NEW MEXICO.**GRANT COUNTY.**

A 60-lb. lot of turquoise rock was taken from a 36-ft. shaft at the Cameo mine of G. W. Robinson at Hachita.

OTERO COUNTY.

The plant of the Orogrande Smelting Co. at Orogrande is practically completed and the manager, J. J. Murry, is in the field buying ores.—Several carloads of ore have been shipped by Charles H. Knibbs from the Delusion mine to the El Paso smelter.—Culver & Downs have cut several veins of ore on their property, but have made no attempt to stope any of the ore.

SOCORRO COUNTY.

The aerial tram of the Mistletoe Mining Co. at Kelly is nearly completed, and it is expected to have the mill running in a short time. An adit has been started on the Helen Cross claim to tap the orebody at greater depth. W. F. Gordon is manager.—The German Mining Co. has advertised for bids to drive a 900-ft. adit on its property in Kelly gulch. Power will be furnished by the Tri-Bullion Mining & Smelting Co.'s plant.

OREGON.**JOSEPHINE COUNTY.**

At the mill of the Greenback mine 15 stamps have been put in operation, and it is the intention of the lessees to have all 40 dropping in a short time. J. P. Anderson is in charge of the work.

LAKE COUNTY.

J. F. Cutler and associates have purchased the mining property of William A. Schauers on Mt. Hoag.—McVey brothers are sinking a shaft on the contact on their property near Goldberg.—An excellent orebody was recently

cut in the Goldberg Butte mine.—The shaft of the Jumbo Chief is being re-timbered and the company plans to sink to the 200-ft. level.

UTAH.

BEAVER COUNTY.

A new 200-ft. double-compartment shaft is to be started at the Hub mine in the Star mining district. A good showing of copper, lead, and silver ore has been obtained by surface work on this property. John Thompson is manager.—The Beaver Carbonate Mining Co. is to construct a new milling plant at its mine near Frisco. The company has opened a body of milling ore on the 700-ft. level that is 20 ft. wide. A raise from the 700-ft. level has been driven 200 ft. in ore. Grant Snyder is manager.—Assays from samples from the face of the drift run at the 140-ft. level of the Black Rock shaft ran 40% copper, \$3 gold, and 16 oz. silver. The vein is on a contact and is 4 ft. wide. Walter James is in charge of the work.—The shaft of the Cupric Mining Co. has opened several small bodies of ore that have assayed as high as 35% copper.

DAVIS COUNTY.

The Burro Mining Co. is developing a group of eight claims in the Bountiful mining district. An adit has been driven 250 ft. toward the vein, which is on a contact between quartzite and limestone. The company has built nine miles of road to the mine and opened the vein by a number of open-cuts and winzes.

IRON COUNTY.

The Gold Springs Mining & Power Co. has let a contract to the Westinghouse Machine Co. for the installation of two 16 by 18-in. three-cylinder gas engines, two 190-hp. gas producers, and two 100-kw. Westinghouse generators to be installed at the Jennie mine at Gold Springs. The company is to let contracts for mine equipment and cyanide plant machinery. Charles A. Short is manager.

JUAB COUNTY.

H. J. Meyer, manager for the Trout Creek Mining Co., brought a number of samples from the company's property to Salt Lake for assaying. The ore is very complex, containing zinc, bismuth, copper, silver, and gold.—The Utah mine at Fish Springs is to resume paying dividends. Payments were suspended from the first of the year to purchase part of the Last Chance claim and to install a new 50-hp. gasoline hoist. The company is shipping three cars of ore per month that averages over \$100 per ton.—The Hannibal Mining Co. has been formed at Provo to work a group of claims in the Tintic mining district.—The Tintic smelter has resumed operations after a few weeks shut-down for repairs and the installation of new machinery. The mines are again shipping ore to the smelter, which is running satisfactorily.—The International Smelting & Refining Co. declared a dividend of 1½c. per share, payable September 1.—At the Colorado mine near Eureka a 30-ft. winze has been sunk in ore from the 300-ft. level. The Colorado company declared the regular monthly dividend of 8c. per share, amounting to \$80,000.—The Sioux Consolidated declared a dividend of 7c. per share, payable August 20.

SALT LAKE COUNTY.

The stock of the company operating the Prince of Wales mine at Alta has been increased from 10,000 to 30,000 shares. The company is now shipping 40 tons of ore to the Taylor & Brunton sampler and is increasing its stock to raise money for more extensive development.—The Yosemite Mining Co. has been organized to work the Yosemite, Cluster, and Mississippi groups at Bingham.—Samuel Newhouse has abandoned Edward Fink in his attempt to make the Fink smelter a success and the plant at Garfield has been closed down. One trouble with the furnace was with the tuyeres, no material being found that would successfully stand the heat.

SUMMIT COUNTY.

The Silver King Consolidated Mining Co. has at last cut the contact for which they have been driving for some time, and opened a body of silver chloride and bromide

ore with some galena. The company sunk an 1100-ft. shaft and cross-cut 2000 ft. From the face a 500-ft. winze was sunk and a short cross-cut run to the contact. A number of veins were cut in this work, but none large enough to be of commercial value. Solon Spiro is manager.

WASHINGTON.

CHELAN COUNTY.

(Special Correspondence).—The Washington-Meteor mine has been leased by Davis & McDowell, who recently acquired the Blinn group.—In Red Mountain district the Chihuahua Lead & Silver Mining Co. is driving a long adit to cut the vein exposed on the surface of its property.—The Chelan Consolidated Copper Co. has driven an adit into Red mountain 1300 ft., and opened a 5-ft. vein of high-grade ore at a vertical depth of 1500 ft. New York people are the principal ones interested. The company will drive the adit 1200 ft. farther, to intersect another vein, from which some excellent ore was taken in the upper levels.

Wenatchee, August 17.

FERRY COUNTY.

(Special Correspondence).—About 2000 tons of ore have been shipped by the New Republic Mining Co. to date. The management reports two veins of shipping ore cut south of the old workings, one between 4 and 5, the other between 2 and 3 ft. wide.—The Black Tail Mining Co. at Republic has shipped 12 carloads of ore under the present management and is now figuring on installing new machinery.—The lessees of the Ben Hur mine have shipped four carloads of \$22 ore and have two more ready for the smelter.—The South Republic Mining Co. has opened a stope 125 ft. below the adit level.—The Grand View Mining & Milling Co. has filed articles of incorporation at Spokane to operate the New York, Ophir, and Independent lode claims, about three miles south of the international boundary line, near Danville. A shaft has been sunk to a depth of 80 ft.—The Kettle River Mining Co., near Rockcut, is sinking on a 5-ft. vein of rich galena ore. The mine has been equipped with a steam-hoist, compressor, machine drills, and pump.—The Pearl Consolidated Mining Co., operating its mine on a leasing system, has reduced the indebtedness to \$5000 and has \$3400 in the treasury for running expenses. As no satisfactory offers have been made to lease the mine since the former lease expired August 1, the property may be worked under the company's management.

Republic, August 16.

OKANOGAN COUNTY.

The shaft of the Molson Mining Co. at Molson is down 105 ft., with a station cut at that point. The company will install a hoist and develop the vein from this point.

STEVENS COUNTY.

(Special Correspondence).—Ten tons of hematite were forwarded from the Vigilant mine to the Valley smelter. About 5000 tons per year have previously been shipped to the Idaho and Coast smelters.—The North American Marble Co. has erected a surface plant and dwelling houses for the men at its quarry near Valley. The beds are extensive and furnish a variety of shades.—The Forrest Mining & Milling Co. has completed the installation of a 10-ton Hesse cyanide plant at the Easter Sunday mine.—A diamond-drill with a capacity of 600 ft. has been ordered by the First Thought Gold Mines, Ltd. The company is shipping four carloads of ore per week to the Trail smelter, and is expected to commence building a cyanide plant at the mine shortly. Alexander Sharp is manager.—The shaft at the Copper-Butte is down 150 ft. in a vein of copper-gold ore, and a contract let to sink another 100 ft. At the 250-ft. level drifts will be started on the vein and stoping commenced.—The Pierre Lake Gold & Copper Co. has been incorporated to develop the Commonwealth group. Frank Werhardt, F. L. Newton, and W. Nelson are the incorporators.—The Imperial Copper Co. of Chewelah is installing a boiler, pump, and hoist at the mine. P. J. Bonner is in charge of the work.—Operations are to be resumed at the Montezuma group, eight miles west of Chewelah. Warner Apelson, of Portland, is the principal owner.—The High

Grade Silver & Copper Co. has been organized at Chewelah. There is a 110-ft. shaft on the property and the company plans to sink this and cross-cut at a lower level. T. F. Hertzell is manager.—The drift at the Bornite mine near Newport is in 800 ft. on a 2-ft. vein of excellent ore.—At the Treadwell mine near Northport a shaft is being sunk on an 8-ft. vein, 30 in. of which is high-grade galena ore. H. W. Jackson is manager.—The return from the Boulder smelter on a shipment of tungsten ore from the Tungsten King mine in the Deer Park district was \$460 per ton.

Colville, August 14.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The differences of the B. C. Copper Co. and its miners are to be settled at an early date. The company has agreed to give the union the same recognition and pay its members the same wages as the Granby and other operating properties in this district are doing. The questions between the miners and the company are now under discussion, and it is likely that a working arrangement will be the outcome. Local mining men look for a resumption of work at both the B. C. Copper and New Dominion mines early in August. There is a sense of relationship between these companies since the Lewisohn interests have become identified with the B. C. Copper Co. —The new slime mill at the Jewell mine will be completed in a week or ten days, when the process which proved so successful on a small scale will be put to a working test. There is a big body of concentrating ore ready for stoping in the Jewel, and it will prove a boon to the men interested if they can secure the desired recovery of metallic content with the new system. A lead nearly 90 ft. wide has been uncovered on the Le Roi claim, West Fork, where development is now being carried on. The lead has been exposed for several hundred feet. Two shafts are being sunk and are now down 75 ft. An average assay of the orebody returns 47% iron, 30% sulphur, 2½% copper, and small quantities of gold and silver. The tunnel on the Woodburn property of the Phoenix Mining, Smelting & Developing Co. has been driven 300 ft. toward the orebody. —Extensive work is being done on the pegmatite dikes of the Big Bend district. It is only a matter of time until development and transportation will open a big mica-field in this district. The companies who own the mica deposits are petitioning the Government for better roads and trails. A strike of copper glance, assaying 64% copper, and 48 oz. silver per ton, has done a lot toward dispelling the illusion that no appreciable amount of mineral might be found in the Coast Range. A vein 8½ ft. wide was found near Douglas channel by an old prospector, and work is now being done on it. The find is considered of importance. That the Portland Canal mining district will prove an important factor in the progress of mining in this province is shown by some assays recently taken on the Red Rock group, where active work is now in progress. Average Red Cliff ore assayed 1.90 oz. gold; 2.60 oz. silver, 17.80% copper; total value per ton \$72. On the Montrose claim the auriferous mudic ore assayed 6.30 oz. gold, or \$126 per ton. The entire Red Cliff vein is approximately 100 ft. wide, that on the Montrose from 35 to 40 ft. A strike on the Richard II property last week in a 4-ft. vein assayed \$250 in silver and \$60 gold. The Richard II is controlled by the Stewart Mining Co. of Victoria.

Rosslund, August 14.

The British Columbia Copper Co. has purchased the claims adjoining the Jackpot group from D. Oxley. The engineers of this company are examining several properties at Kamloops.—The Alaska Mining Co. is to resume operations on the Buster and Alaska claims on Wallace mountain. A 35-ft. shaft has been sunk on a vein of lead-silver ore.—The Nicola Valley Coal & Coke Co. have purchased a 30-drill Rand compressor. The output of the company is 400 tons of coal per day at present and the installation of this additional power will increase it to 1000 tons per day.—The Lelitch Collieries Co. has commenced work on a new property at Police Flats east of Passburg.—A contour map of the Sheep Creek mining

district has been issued by the Geological Survey.—Samples taken from the Brown-Bulldog mine between Princeton and Hedley assayed 5% copper, 14% zinc, 8 oz. silver, and \$8 gold.—The Lucky Jim Mines, Ltd., is preparing to ship 200 tons of ore per day from the Lucky Jim mine near Kaslo. The ore is zinc-blende and averages 35% zinc.—The force at the Snowshoe mine has been increased and the output of the mine raised from 600 to 700 tons of ore per day. The company is mining the ore with an electric stripper.—The Columbia Copper Co. is opening a large body of bornite ore on its property in the Similkameen district.—Ley & Douglas have resumed operations on the Alice mine near Creston.

A contract is to be let to sink a 200-ft. shaft on the Blue Bird mine near Rosslund. The mine has previously been worked by lessees operating on a percentage basis. The net return on a shipment of 10 carloads of ore was \$30 per ton. L. C. Carter is manager.

ONTARIO.

The McKinley-Darragh company is planning to install 10 additional stamps in its mill to handle the increased output from the mine. The present stamp duty in the mill is four tons per 24 hours.—The Paymaster mine opened a 6-in. vein of cobalt on the 115-ft. level 150 ft. north of the shaft.—The O'Brien mill at Cobalt has been completed and 10 stamps in the concentration and sampling department have been started. The 30 stamps run in connection with the cyanide portion of the mill will probably be started about the first of September.—The shaft at the Ophir mine in South Coleman cut a 4-in. vein of native silver at a depth of 75 ft.—A 6-in. vein assaying 4500 oz. silver per ton was opened by surface trenching on the Nipissing property.—The Silver Cliff company shipped two cars of 600-oz. ore from its mine at Cross Lake. The company is having plans drawn for a 100-ton concentration plant to be erected at the mine in the near future. The company will resume sinking about the first of September.—About 200 ft. from the Foster boundary on the Lawson property a 20-in. vein of calcite and silver ore has been opened that is equal on the surface to the famous silver sidewalk. The average assay across the 20 in. is 3900 oz. silver per ton.—The Trethewey company has made the preliminary survey for a 30-stamp mill and concentration plant.

MEXICO.

GUERRERO.

A smelter with a capacity of 100 tons per 24 hours is in course of erection on the property of the Maine-Nebraska Mining Co., 1½ miles from Balsas. The company has obtained the concession of a water-power that will develop 100,000 hp., from the Mexican Government.

MEXICO.

Valentine Eleoro & Co. has installed a 10-stamp mill, re-grinding plant, and Pachuca tanks for cyaniding at their San Antonio mine near Temascaltepec.

OAXACA.

The Victoria Tapada is installing a cyanide plant at its mill.

SONORA.

The third shipment from the El Tremblor mine in the El Tigre district, amounting to six tons, is being sent to the railroad. On the two previous shipments the ore averaged \$330 per ton. The property is owned by N. D. Shippy and James Taylor.

TEPIC.

Waldo G. Myers is to install a complete milling and cyanide plant on his Zapote mine near El Lisco. There is an excellent water-right held in connection with the mine that will furnish ample power for all power purposes.

ZACATECAS.

Vasquez Mercado and Francisco Ortega have purchased the tailing dumps near Villa de Guadalupe for a European corporation. There is estimated to be from 3,000,000 to 4,000,000 tons of tailing in these dumps.

mining companies have made distributions reaching a total of £4,542,494. The greatest amounts paid were the following: East Rand Proprietary, £449,179; Robinson, £412,000; Simmer & Jack, £300,000; Ferreira, £142,500 and a bonus of £190,000. The dividends aggregate for the whole of last year, £8,569,916. Gold-mining companies outside of the Rand only declared £50,201 in dividends for the half year. More pitiable is the showing of the coal-mining industry. The Transvaal turns out about 3½ million tons of coal per annum, mostly for use on the Rand, and yet the coal mines' dividends total for the half year only £46,000, distributed by three out of about 30 collieries. Efforts made to establish a combination among the coal-producing concerns have not borne fruit. The value realized at the pit-mouth is now only \$1.20 per ton, though standing at \$1.80 per ton five years ago.

The death of Wager Bradford, manager for the Robinson Gold Mining Co., has caused universal regret. The deceased, one of the leading American engineers on the Rand, was born at Stockton, California, in 1863, graduated at Hamilton College in 1885, took a post-graduate mining course at the University of California, and came to the Transvaal in 1896. He has been manager of the Buffelsdoorn Estate and of the Langlaagte Deep (Rand Mines Group) since 1897. Early this year he assumed control of the Rand's premier mine, the Robinson. Mr. Bradford was a vice-president of the Chemical, Metallurgical & Mining Society, and took a leading part in public life, scientific and social, in Johannesburg. His body will be embalmed for interment in California.

The valedictory address of E. J. Laschinger, retiring president of the South African Association of Engineers, was full of good points. He dwelt convincingly upon the importance of recognizing the difference between 'efficiency' and 'effectiveness of method,' and contended that the economies which had been witnessed on the Rand of late were due to a study of both these factors. There still remains room for "vast improvement in the efficiency of labor." A thoroughly practical suggestion thrown out was that of organizing a staff or staffs of specialists, unfettered by routine duties, to investigate the problems of working-efficiency as they arise, and elaborate the details for the benefit of the industry.

The June output showed a decrease of 7270 oz. as compared with the longer month of May. The declaration of £2,621,818 for the Transvaal brings the total for the half year up to £15,447,500. There was no change in the stamp-position in June, the Rand total being 9140 stamps. Native labor returns continue to show the wastage characteristic of the present winter months. There were 8335 natives distributed, and 12,354 'boys' left as time expired, resulting in a wastage of 4019 'boys' for the month. This follows the May loss of 4622 Kaffirs. There still remain over 5000 Chinamen to be repatriated.

ROSSLAND, BRITISH COLUMBIA.

Le Roi Resuming Work — Centre Star. — Phoenix. — French Investments. — Fern Mine.

A small crew of men have been put to work at the Le Roi mine making preparations for the resumption of operations at that property. As has already been stated, development will be the chief feature of operations at the Le Roi for some time. A special fund of about two million dollars has been raised and within a few days the initial work will begin. Part of the plan is to explore from the 1650-ft. level to the 2650, in the most likely region of the mine with a diamond-drill. Ore shipments from the Centre Star Consolidated group during the week ending July 24, made a new record for the year, 4680 tons, exceeding the week ending May 1 (4280 tons) by 400 tons. The lowest shipments this year from the Centre Star were for the week ending January 9, 2950 tons. The activity at the Centre Star group here is making things hum at the Trail smelter of the Consolidated company down the hill. The value of the gross output of the smelter for the last month for which the figures are available was over \$800,000. Each month the refinery ships over 200,000 oz.

of silver to China. This metal is made 0.999 fine at Trail and is used for coinage. The Ottawa mint has been supplied from here with 250,000 oz. gold, for coins. The future looks bright for this plant, which was built by F. Augustus Heinze in the early days of the district (1896).

The mines of Phoenix have shipped over half a million tons of copper-gold ore already this year. While this is something less than was shipped to this date last year, it is stated that the grade of the ore is higher, and the way things point now conditions are favorable for exceeding the tonnage of last year to quite an extent. Boundary ore yields about 24 lb. copper per ton so that the recovery has been about 12,000,000 lb. Both the Granby and B. C. Copper companies are producing a good grade of converted crude copper and are laying it down in New York at approximately 10c. per pound. At some periods the figures have run as low as 8c. per lb., but this cannot be counted on, although there is little doubt that this figure will be reached in the Boundary in time. Things are getting into working form at the property of the B. C. Copper Co. Ore is being taken out, and a good crew is at work, although the force is far from complete. As yet smelting has not been resumed at the Greenwood plant. The shipments from the Snowshoe are being increased. The ore is being sent to Trail. Considerable surface work is being done. It is reported that the deal for the Nickel Plate at Hedley has been consummated, and that extensive work is likely to be started soon.

French capitalists who are interested in the big Blue Bell mine have been visiting the district during the past week. It is announced that French capital is being attracted by British Columbia, and that considerable Parisian money will find its way to meritorious local mines in the future. There are a number of metal and coal mines in this district now which are financed by Frenchmen. The old Fern gold mine has been re-opened and will be worked on a goodly scale. A 3-ft. vein of galena ore has been opened in the lower levels of the Westmount. About 20 men are now working at the mine. Auriferous gravel yielding \$10 to \$15 to the pan has been found in Summit creek. Work has been resumed at the McAllister mine, Three Forks, a promising silver property.

Frederic Keffer, consulting engineer for the B. C. Copper Co., has been examining some of the more promising mines in Kamloops district. On the strength of his report it is likely that the company will do development with the diamond-drill. This concern is pursuing an expansive policy, as is the Granby and the Consolidated of Canada. A railway is now being run to the Wellington and Central camp mines of the B. C. Copper Co., which will at the same time give an outlet for dozens of other properties yet in the growing stage. After three years of prospecting the owner of the Brown-Bulldog property, near Princeton, has opened up a 35-ft. lead assaying 5% copper, 14% zinc, 8 oz. silver, and \$8 gold. The ore is self-fluxing and the facilities for loading it on the cars at the railway near-by are good.

The Ikeda (Japanese) copper mine, Queen Charlotte Island, has been bonded to an English syndicate for \$200,000, for a period of two months. The group has so far proved rich in copper and gold; the ore fluxes easily, and transportation facilities are ideal. Quite an amount of American capital is coming into Nelson district of late, the acquisition of the Highland-Buckeye, Lucky Jim, and other silver-lead and gold mines, being examples.

BUTTE, MONTANA.

Rich Discoveries. — High Ore Mine. — Elm Orlu. — Gagnon — La France Co. — Electric Power. — Sierra Consolidated Mines Company.

John D. Ryan's faith in the copper mines of Butte, and his extreme optimism regarding their future is being justified by improved conditions in the mines of the Amalgamated Copper Co., the North Butte, Butte Coalition, and other properties. The recent strike on the 2800-ft. level of the High Ore mine of the Anaconda Mining Co. is of importance. It is the deepest point at which mining is being done in the Butte district, the next deepest being on the 2400-ft. level of the Anaconda mine. The High Ore is 600 ft. deeper

than the Speculator shaft of the North Butte company. It is significant that on the next level above the 2800-ft. in the High Ore the vein was comparatively lean, but on the new level the vein opened rich again, and some of the finest looking copper glance ever seen at the Washoe smelter is being shipped. The discovery repeats the history of Butte mining, rich levels being found after an experience of several poor ones. It is expected that by the latter part of October the Jessie vein will be cut on the 2200-ft. level. By the first of the year the Granite Mountain shaft will be completed down to the 1600-ft. level, and will be put into commission as a second working shaft, when the production will be increased fully 100%. Connections are being made with the shaft from three levels, and other development is being carried on, including the extension of the 2200-ft. cross-cut, and another cross-cut on the 1800-ft. level to the Berlin group.

The new level being opened by the Butte Coalition on the 1700-ft. levels of the Tramway shaft into the Minnie Healy ground has opened several new veins of remarkable richness. Without attempting to push the production of the Butte Coalition the ore output has been gradually increasing, due chiefly to the opening of several new veins and new levels. The Rarus and Minnie Healy mines are now yielding about 1600 tons of ore per day, of a somewhat lower grade than formerly, more of the second-class ore being shipped.

In the Little Mina, diamond-drilling, done for the purpose of opening a drainage into an adjoining mine, has disclosed a continuation of the good ore in the vein to a depth of 1700 ft., or 600 ft. deeper than the present lowest level. Work on the Parrot mine continues without producing sensational results. The vein is being opened on the two lower levels, and while the ore is of a low grade, conditions are not discouraging, and the mine is yielding its usual quota of ore, about 400 tons per day.

In the Elm Orlu mine, owned by W. A. Clark, a tremendously rich vein has been opened on the 1200-ft. level, and several hundred tons of ore are shipped daily. The Elm Orlu ore runs 12% copper and is unusually high in silver. The vein is said to extend under the Pilot claim, owned by the Pilot-Butte company, which latter company has not been operating since the financial slump of 1907. Adjoining the Elm Orlu on the east are the properties of the Butte & Superior Copper Co., which is opening good copper orebodies on the 1200 and 1400-ft. levels. The Butte & Superior has in the Blackrock an immense body of zinc ore, from which regular shipments are now being made at a profit to the company. The Tuolumne Copper Co. is winning gratifying results. Its claim is situated near the Speculator of the North Butte company. It is opening the 1400-ft. level. The vein on the 1000-ft. level is about 20 ft. wide.

The Gagnon on the new level is developing practically a new mine for the Trenton Copper Co., an Amalgamated subsidiary, and it is not unlikely that the Trenton will, before long, become a dividend payer again. The property was a keen disappointment to the Amalgamated people when they found what had been acquired, but development was pushed, and after sinking the shaft several hundred feet deeper a new orebody was uncovered. So satisfactory has the development been that the company has concluded to sink a new working shaft in place of the old incline shaft.

Operations may soon be resumed at the Lexington mine by La France Copper Co. At the recent meeting of stockholders it was stated that La France company was again unable to meet its July coupons on bonds, and that the United Copper Co. would probably issue its notes at 6% again, as it did last year. La France company has not yet been able to raise money with which to redeem its property, which was sold two years ago for about \$5000 delinquent taxes, but it has paid the tax for 1908. The new directors of La France are: W. A. Kidney, R. A. Carnochan, David Gilbert, and E. M. Brennan, of Butte, and John T. Williams, of New York.

Work has been started on the construction of the electric wire line from Great Falls to Butte, by means of which electric power is to be conveyed to the Butte mines from

the two great power-dams now being erected on the Missouri river by John D. Ryan and associates. As soon as the line is completed it is anticipated that the power-plant will be completed. Then electric power will replace steam-power in all the mines of the Amalgamated Copper Co., the North Butte, and Butte Coalition, in the Butte district. Few changes at the plants will be necessary for the substitution, and the steam plants will be kept in reserve as auxiliaries.

The Cole-Ryan people have made a new flotation of a Mexican gold property. The company is known as the Sierra Consolidated Mines Co., with a capital of \$5,000,000, divided into 500,000 shares, of which 300,000 shares are to be issued to pay for the property and provide a working capital of \$1,520,000, on the payment of \$10 per share. At present only \$6 per share will be called for. The properties, consisting of both mineral and timber land, and a number of old producing mines, comprises 60,000 acres situated in the Ocampo district of western Chihuahua.

SALT LAKE, UTAH.

Tintic Smelter Resumes.—Copper Output of Utah.—Ohio Copper not Bought.—Fink Smelter Abandoned.—Uncle Sam Dividend.

D. Lester Mangum, general manager of the Tintic Smelting Co., has notified shippers that they can resume shipments. The smelter has rekindled its fires in three of the lead furnaces, and will have these running at full capacity by Wednesday. All repairs and the overhauling of the entire plant have been completed. New blowers of larger capacity have been put in, the sintering plant has been changed, and the big reservoir is filled to the brim. A trial has been made of every department and the results are reported to have been highly satisfactory. The fourth lead furnace will soon be blown in, and finally the copper furnace. This will give the plant a capacity of 900 tons of lead ore and 225 tons of copper ore daily. An inventory of the ore and bullion on hand at the time of the shut-down has been made, and it is learned that the smelter has made a small profit on its operations for nine months. This has resulted in a determination on the part of the Knights, the principal owners, to continue the plant, and a bid will be made for all ores coming into this market. When Jesse Knight decided to build this smelter he promised the shippers that he would keep the plant in operation steadily. Several attempts have been made to purchase the smelting plant, and the Iron Blossom and the Colorado mines, all owned by the Knights. In so far as the Cole-Ryan interests were concerned all things were agreed upon with the exception that they would not agree to make the Tintic smelter a permanent plant. The Knights would not agree to a sale unless these furnaces were to run, and now the Knights have concluded that as long as there is a profit to be made in the smelting business they will not sell. The representative of the Cole-Ryan interests has just left the city and announced the deal as off.

The copper output in Utah for July shows approximately 11,000,000 lb. delivered to the Garfield smelting plant. Of this the Utah Copper Co. supplied about one-half; Boston Con. is next with over 2,000,000 lb. An estimate of the profits on the production is placed at \$500,000. From a State that produced scarcely any copper a couple of years ago, Utah is now taking high rank. With July as a basis, 132,000,000 lb. of copper are now being produced by the mines of this State annually on which there is a profit of \$6,000,000 per year at the prevailing market prices. With improvements now under way in the milling plants, and the mines that are scheduled to come in with a large tonnage of copper, this output will be doubled within the next two years.

There seems to be no ground for the report of the purchase of the Ohio Copper by Cole-Ryan people. While a considerable amount of money has been raised to pay off the floating indebtedness of the Ohio, it seems to have been obtained from another source. The steel structural work for the trestle has not arrived, and in the meantime the second unit of the mill is being completed; this is to be

followed by construction of the third section. Colin McIntosh, the general manager, says that they will have the mill running within 60 days. Samuel Newhouse and Edward Fink could not agree upon the formation of a company to take over the Fink patents on the new smelting process, and the plant is idle. Mr. Fink has returned to his home in the East, and Mr. Newhouse will carry on no further operations, unless some adjustment of the existing differences can be patched up. There is great disappointment over this turn in the affairs of the new smelter.

A dividend of 10c. per share, aggregating \$10,000, has been posted by the Uncle Sam Consolidated Mining Co. A dividend has also been declared by the Iron Blossom, of 8c. per share, amounting to \$79,200; by the Colorado, 8c. per share, aggregating \$80,000; and the Sioux Con., of 7c. amounting to \$52,457. All these are Tintic producers.

LOS ANGELES.

Mile Deep Hole of Union Oil Co.—Developments Around Piru, Ventura County.—Lower California.

The deepest hole in California and the deepest producing oil-well in the world has just been completed by the Union Oil Co. on their Brashear lease, in the Salt Lake field, seven miles west of Los Angeles. It is known as Brashear No. 1 and is 5323 ft. deep, or 43 ft. more than a mile. This well was begun in March, 1907, and drilling operations have been going on continuously ever since, that is, for a period of two years and five months. The total cost of the well has been roughly \$40,000. An ordinary standard rig was used and no unusual conditions were met in the drilling, nor were any innovations attempted in manipulating the tools or cables. It was just straight drilling. The usual care displayed by the drillers of the company enabled them to attain the great depth. Manila cable was used to a depth of 1000 ft., and after this a steel cable. The formations drilled through were conducive to successful operation, being largely brown shale, which stands up well ahead of the casing. The log of the well is as follows:

| | To feet. |
|---|----------|
| Soil, sand, and gravel (the superficial formation over the whole Salt Lake field; traces of tar at 100 ft.) | 100 |
| Brown shale | 240 |
| Tar sand | 250 |
| Brown shale | 2,792 |
| Rich oil sand..... | 2,795 |
| Brown shale (showing of oil in thin sand and also in the associated brown shale here)..... | 5,232 |
| Oil sand (a good clean quartz sand, yielding a light-gravity oil) | 5,256 |
| Brown shale | 5,323 |

Some record strings of casing are used in the well, as follows: 100 ft. of 15-in., 1048 of 12½, 2900 of 10, 3908 of 8¼, 5323 of 6½. A pump was installed in the hole at 3300 ft. from the top, and enough oil came through the intervening 2000 ft. of water from the oil sand at the bottom to partly fill the sump on a trial pumping test. The pump is now being lowered 1000 ft., and it is the belief of the officials of the company that with but a thousand feet of water to penetrate, the oil will rise in quantities sufficient to pay to operate. It takes nine minutes to raise the tools from the bottom of the well.

Until the completion of Brashear No. 1, the well of the Los Alamos Oil & Development Co. in the Lompoc field, Santa Barbara county, which is over 4400 ft. deep, was the deepest producing well in the world. This well, which until very recently produced 30 bbl. or so of light oil, together with considerable quantities of water, has lately stopped producing water and has increased the yield of oil between 300 and 400 bbl. per day. It is a wonderful well considering the difficulties of manipulation at such great depths. Another deep well which is attracting considerable attention is that of the Santa Fé Railroad company in the Kern River field, which is now down over 4230 ft. It is believed to be below the oil sands of this region and will probably be abandoned without obtaining any positive results.

Little development work is being done in the fields about

Piru, Ventura county, although several old properties like the Torrey, Eureka, Sunset, Fortuna and Modelo are operating wells drilled several years ago. The permanency of the wells in this part of the State is wonderful, many of the holes producing nearly as much oil after a lapse of eight or ten years as they did after a lapse of a year or so following their completion. The fall-off in production is quite rapid, usually about 75% in the first 90 days, but after this time the rate of decrease is very much less. The Harris Oil company, operating between the Modelo and Sunset groups, is drilling some new holes with more or less success, and the Couch well, in Torrey canyon, one-half mile below the Union's wells in the same canyon, is just being finished up with something less than 100 ft. of oil-sand in a hole less than 500 ft. deep. This last well proves considerable new territory north of the Torrey group.

Concerning the prospects for oil development in Lower



Brashear Well, A Mile Deep.

California, W. W. Orcutt, chief geologist of the Union Oil Co. tells of an experience he had in examining an 'oil seepage' near Ensenada. The parties who were showing him the prospects took him along the top of the sea-cliff for several miles, and finally, arriving at a particularly precipitous part of the bluff, triumphantly pointed to some black streaks apparently emanating from below small overhanging blocks of the white stratified volcanic ash of which the cliffs were composed. The streaks certainly looked like tar seepages, so after a hazardous climb, the inquisitive geologist arrived at one of them, when to his surprise he saw the seepage gradually melt away into a swarm of buzzing black flies. These flies, like the native inhabitants of the country, wished to rest in the shade, and sought the only available places, the small overhanging ledges of the sea-cliff. Thus do the hopes of the oil man often take wing.

KALGOORLIE, WESTERN AUSTRALIA.

Recent Developments.—Meeting of Australian Institute —Geological Features of Kalgoorlie.—Tailing Disposal.—Statistics of Production.

What with numerous developments from one end of the field to another, two discoveries of tin, and the visit of the members of the Australian Institute of Mining Engineers, this has been an interesting month. At the north end of the belt there have been fair developments in the Golden Link; then the Kalgurli is down now to 1700 ft., and is erecting a new hoist for deeper work; in the Per-

severence upper-levels some promising discoveries have been made; work at 1970 ft. in the Ivanhoe is revealing plenty of ore of better value; while at 2000 ft. in the Horseshoe, the east branch of the No. 3 lode is 18 ft. wide, worth \$22 per ton, these being free gold and telluride ores from wall to wall.

Two discoveries of tin were made, one in the northwest fields, and the other some 12 miles from Coolgardie. Not much work has been done on the latter find, but assays return up to 67% Sn; while some tantalite is also present, giving 45% tantalic oxide, rather low-grade as compared with the stibis-tantalite found with tin in the Green-bushes field in the southwest.

An extraordinary return comes from the Nemesis mine at Yuckanana, 60 tons from a depth of 250-ft. giving gold worth \$24,000.

During the year 1908 the Kalgoorlie Electric Power & Lighting Co., which supplies many of the mines, tramways, and other enterprises, with power, made a profit of \$105,000. After paying interest on debentures, dividends on preferred and ordinary shares, dividend duty, depreciation and renewals, \$6000 was carried forward. Preferred shares were paid at the rate of 6%, and ordinary shares 4% per annum. In May, 1901, the Australasian Institute of Mining Engineers visited this centre; and during the past week the members paid another visit. These consisted of many mining men from all of the Eastern States of Australia, and also a number of students from the several Schools of Mines in the East, it being the custom of the Institute to give prizes to the students who write the best papers on the trip, or on the mining and metallurgic work in the district visited. Had there been no labor troubles in Broken Hill, and no depression in Tasmania and other centres, many more visitors would have come. The local committee at Kalgoorlie had made all arrangements for the comfort and interest of the members, and everything passed off well. On May 26, at 8 p. m., the Presidential speech was delivered by R. Hamilton, manager of the Great Boulder Proprietary, and a conversation was also held. This meeting was held in one of the lecture rooms of the School of Mines. Mr. Hamilton's interesting address was more in the form of a lecture. He traced the history of the Kalgoorlie field from its beginning; the new ores that puzzled the prospectors; the types of lodes, and the reason why so many remained so long undiscovered; the methods of mining; prospecting by diamond-drill; the two principal processes of treatment in vogue; and some interesting statistics in conclusion. The lecture was made more interesting by blackboard diagrams, especially in connection with diamond-drilling. Mr. Hamilton has had much experience in that work, and he stated that horizontal holes were more reliable than those put in at a depressed angle, the drill always tending to run at right angles to the dip of the country; he had not yet solved this peculiarity of the drill. The President then introduced Mr. Adams, who read a paper on 'The Disposal of Residue in Kalgoorlie.' This was of interest as it contained new data on the sluicing system of dealing with the residue from filter-presses alone; presses and vacuum together; and from the vacuum process alone. The writer dealt with the pumps, pipe-lines, dams, and detailed costs. H. Gregory, the Minister of Mines, dealt in a clear manner with the subject of Technical Education under the Mines Department, and with mining generally.

In the lecture hall of the School of Mines museum on May 27, about 120 mining men listened for 2½ hours to a lecture on 'The Geology of the Kalgoorlie Field, with Special Reference to the Orebodies', by Mr. Larcombe, the instructor of Geology and Mining at the School. It was a brilliant lecture. He commenced with a resumé of the geology of Western Australia, showing slides, sketch maps of the Golden Mile, and others; a section from east to west; and microscopic views of rock-sections thrown on a screen. Mr. Larcombe is preparing a geological report on the Kalgoorlie field, which will be published by the end of the current year.

On May 28, in the museum lecture hall, a most interesting evening was spent. The State Mining Engineer,

Mr. Montgomery, read a paper entitled 'Some Geological Considerations Affecting Western Australian Ore Deposits'. He dealt at length with the geological conditions in the State. Western Australia was beneath the sea within recent geological times, the salt water found locally was due to this fact. The extra richness in the oxidized portions of the lodes was due to secondary enrichment, and as work proceeds in depth the fineness of the gold is lower. In places the granite intruded the diorite. Mr. Hamilton wished to know what had become of the debris from the mountain chains, also the likelihood of the conglomerates around Kalgoorlie carrying gold. J. Malcolm MacLaren stated his conception of the formation of the lodes here. He did not think that Western Australia had been under the sea, as there were no marine fossils, and the arid country would account for the salty nature of the water. He contended that the diorite intruded the granite. Mr. Larcombe then gave his idea of the formation of the lodes in this field. He was not of the 'intrusive' school. The great Brownhill-Iron Duke-Oroya shoot was the result of great fault-planes, while the other lodes were formed by the rock coming up from some deep-seated origin.

The State Geologist, Gibb Maitland, dealt exhaustively with the rocks of Western Australia, more especially those of the northwest fields. He explained these on his new geological maps of Western Australia and Australia, now in press. In his remarks he said that all mine-plans should have geological records marked, and instanced cases in Victoria where the plans and note-books of many mines had been wilfully destroyed. Mr. Montgomery replied shortly, arguing that the question of debris from mountain chains was not so difficult to answer, and that the wide depressions on the fields held a great deal. The conglomerates or boulder beds out of Kalgoorlie he had not examined closely. Marine fossils had been found, although few. As to the granite, he contended that there were two or three kinds in Western Australia. The visitors spent a day in Coolgardie, and on the 30th went by special train up the Rurrawang line to inspect the fuel industry for the field; and the next day the party left for Perth, bound for the Eastern States.

Mr. Hamilton's address concluded by giving some interesting figures: Of \$400,000,000 gold from Western Australia since 1886, Kalgoorlie has yielded \$210,000,000; of \$94,000,000 dividends in that time, Kalgoorlie has paid \$72,000,000; in 1908 the local mines (Kalgoorlie) paid \$6,000,000 in dividends; \$6,000,000 in wages; \$500,000 in general expenses; and \$300,000 in dividend duty. With reference to the latter item, it may be explained that an Act of Parliament was passed in 1902, to levy a duty on companies operating in Western Australia. On companies operating only in Western Australia a tax of 5%, or 24 cents in \$4.80, on the amount or value of dividend paid; and on companies operating in Western Australia and elsewhere, a tax of 5% on dividends paid from the Western Australia business only.

The following were the May returns:

| Name. | Tonnage. | Yield. | Profit. | Dividend. |
|----------------------------|----------|-----------|----------|-----------|
| Associated | 11,707 | \$100,000 | \$18,000 | \$120,000 |
| Asso. Northern Blocks.. | 3,675 | 33,000 | 13,000 | ..... |
| Golden Horseshoe | 25,291 | 260,000 | 100,000 | ..... |
| Golden Link | 472 | 4,000 | *6,000 | ..... |
| Golden Ridge | 2,240 | 28,000 | 14,000 | ..... |
| Gt. Boulder Proprietary.. | 18,307 | 250,000 | 130,000 | ..... |
| Gt. Boulder Perseverance.. | 19,142 | 154,000 | 36,000 | 170,000 |
| Great Fingall | 10,442 | 70,000 | 1,600 | ..... |
| Hainault | 5,116 | 33,000 | 4,500 | ..... |
| Ivanhoe | 19,283 | 210,000 | 100,000 | ..... |
| Kalgurli | 10,640 | 140,000 | 75,000 | ..... |
| Kalgurli South | 9,039 | 61,000 | 12,000 | 49,000 |
| Lake View Consols..... | 10,752 | 73,000 | 14,000 | ..... |
| Lancefield | 4,314 | 33,000 | †10,000 | ..... |
| Oroya-Brownhill | 14,590 | 100,000 | 32,000 | ..... |
| Oroya-Black Range | 4,502 | 55,000 | 20,000 | ..... |
| Sons of Gwalia..... | 13,606 | 102,000 | 32,000 | ..... |
| Sons of Gwalia South.. | 1,886 | 23,000 | 5,600 | ..... |

*Loss. Final clean-up at Lake View Consols mill.

†Loss. First clean-up after a long stoppage.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Ammonia in cyanide solutions is not easy to determine. No simple methods, suitable for routine laboratory use, have been evolved. It can only be done by elaborate analytical methods.

Boro-silicates exist in nature, and may easily be formed when boric acid is fused with metallic oxides, in the presence of oxides of the alkaline earths. Borax when fused with metallic oxides forms double soda-metallic borates, which are extremely fluid, but there is no certainty that the bi-borate of soda is dissociated so as to admit of the formation of silicates. Silica cannot be fused with borax below the temperature for fusion of the silica alone.

Carbonic acid gas is found in large quantity in many mines. When a person is overcome from this gas resuscitation can be brought about by artificial respiration, conducted as in cases of drowning, with the application of ammonia or ether, or vapor of hot-water. As soon as the patient can do so he should be made to drink strong coffee. Camphor in $\frac{1}{2}$ -grain doses may also be administered. Ordinary rhinitis tablets are efficient.

Strontium was not among the mineral products of the United States for 1908. The principal market at present for strontium in the form of the carbonate (strontianite) is in Germany, where it is used in sugar refining. It would be largely employed in the same way by American sugar refiners if it could be had at sufficiently low prices. It is probable that at \$10 per ton delivered it could command a market. Aside from its use in the purification of sugar its only employment is in the manufacture of fireworks, the carmine-fire being produced by burning a mixture of strontium salts with suitable combustibles and sodium nitrate.

Quartz, or flint, as it is termed commercially, is used for wood-filler, pottery, paints, and scouring soaps. It prevents shrinkage in burning pottery. It is also used in glazes. Suitable quartz should contain less than 0.5% of Fe_2O_3 . In paints it helps to resist the effect of the weather. A growing use for quartz of exceptional purity is in making quartz-glass, which is merely fused silica, out of which chemical apparatus is made that has the advantage of not being subject to breakage from expansion or contraction. It is also in some demand for lining copper converters and bessemer steel converters. The total demand is small, sales in 1908 being, crude quartz 23,505 tons, worth \$32,443, and ground silica, 15,320 tons, valued at \$106,203.

Concentration of iron-ore is becoming an important industry in many of the Eastern States and Canada, and is also extensively practised in Norway and Sweden. Both wet methods and dry (magnetic) are employed. In one magnetic system also the pulverized ore is mixed with an excess of water

and caused to flow underneath the poles of a strong electro-magnet, the particles of magnetite being lifted out of the wet pulp. This method is said to avoid the difficulty of carrying gangue over with the concentrate in 'nests' formed under the influence of the lines of magnetic force. Iron-ore concentrate is rendered amenable to blast-furnace smelting by 'nodulizing', which consists in agglomeration in revolving kilns fired with coal-dust, as is done in burning cement. It makes nodules similar to modern rotary-kiln cement-clinker.

Effects of phosphorus, silica, manganese, and other substances in the manufacture of pig-iron are so many and complicated that no resumé can attempt to give much valuable information. The phosphorus of the ore re-appears in the pig-iron, and can be eliminated in steel making only by means of the basic-lined converter, which is little used, or by the basic open-hearth process. Good elimination of phosphorus can in that way be obtained, and the phosphatic slag then becomes a valuable by-product available as a fertilizer. An attempt to discuss the behavior of silica is quite impossible in brief space. No limit can be set as to the amount of SiO_2 that might be accepted in an iron-ore, that depending on its other ingredients, and the local demand. Quotations on ores can be had from iron smelters at Pittsburgh, Cleveland, Chicago, and other points.

Fine jigs, when working improperly, may be brought into form by several adjustments. First look to the hutch; it may have become filled by the breaking of the screen. If the hutch proves to be in good order, the screen should next be investigated, and if 'scratching' does not remedy it, the bed may have to be shoveled off and the screen beaten with an old piece of belting, to clean the meshes and overcome the 'blindness'. The trouble may be from an increase of feed and overloading, requiring more water under the screen. Decreasing or increasing the height of the tailboards are changes of a permanent character which are often found necessary in new mills, lowering the height having, of course, the effect of decreasing the bed and lightening the load, making the jig more 'lively' in its action. If the jig still works improperly, the stroke of the plunger may need adjusting, or the speed may be changed. The length of the plunger-rod has an effect often underestimated, as has also the depth of the dividing board between the plunger and screen compartments. Fine jigs, especially those treating a product less than 5 mm. diam., must generally be bedded by a coarser product, in order to make a good hutch-product. The product through a 3-mm. trommel screen, if properly classified, may be treated on an 8-mesh wire screen, or on a 3-mm. punched screen, and make a satisfactory concentrate in the hutch. The ratio of the size of the bedding material to the size of the feed is generally about 3 to 1, or in other words, a thin bed of concentrate from an 8 or 10-mm. jig makes a satisfactory bed for a 3-mm. jig. This bed, especially if of galena, requires frequent renewing, as the abrasion soon reduces the size of the particles, the abraded material passing into the hutch.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Theory of the Settlement of Slime.

The Editor:

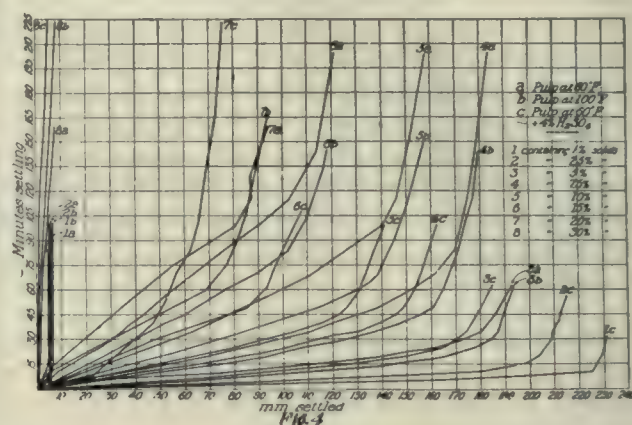
Sir—Harrison Everett Ashley's paper which appeared in the MINING AND SCIENTIFIC PRESS, June 12, 1909, forms a valuable contribution to the discussion on the settlement of slime, inasmuch as it leads us to a consideration of what slime really is. Incidentally, Mr. Ashley's paper calls for an explanation of why viscosity was not specifically mentioned in former contributions on the subject. This important factor was, it is admitted, rather crudely set aside with the remark, "pulp must not be confounded with liquid medium," in the hope, now justified, that this phase of the question of the physics of slime would be introduced by a more competent authority. In connection with this question of viscosity, which is the measure of the internal friction of a fluid, the following considerations are suggested: the 'sol' form of matter may be considered to be a semi-solution. The absorbent gelatinous envelope constituting the 'gel' form, under the favorable conditions named, breaks up, so to speak, and a condition of matter is formed which is not a true solution, being as Mr. Ashley states, a turbid suspension, but which nevertheless approximates closely to the condition of solution. The greater the turbidity the greater, it is reasonable to assume, is the viscosity of the semi-fluid. The addition of acid has the effect of destroying this condition, and of precipitating solid matter from the medium, thereby, as far as the medium is concerned, taken as a whole, reducing its viscosity.

Now, when we come to the last paragraph of Mr. Ashley's article, we find that in dense clay slips, in which the sol form of matter has been created, the addition of acid tends to stiffen the slip as a whole, in other words, to increase its viscosity. Herein would appear to be a paradox, for the explanation of which we return to the definition of viscosity.

Viscosity is the measure of the internal friction of a fluid. Within the meaning of this definition, can a composite mass of solid and liquid be considered as a fluid? Let us take Mr. Ashley's thin pulp. The gel exists upon crystal grains. When water is added the turbid suspension is formed which will not settle. The crystal grains, however, are left in addition. Upon precipitation of the gel form of the colloid, the viscosity of the medium is reduced.

In the case, however, of a dense clay slip, although the same effect is produced in the medium itself by the addition of the acid the result is, that in a composite pulp-mass, already containing a high percentage of solid material, a still further addition of solid matter is created, which in effect, by increasing the concentration, stiffens the slip, but cannot be said to have increased the viscosity of the medium. To take a hypothetical example: supposing a pulp to be

made up of a high percentage of solid slime in a solution of barium chloride; sulphuric acid is added; further solid matter is created as barium sulphate; and thus the ratio of solids to liquids is increased in the mass. Taking Fig. 4 in my previous contribution as an example, is not this contention borne out? We see that in each case, with the exception of the very thin and very heavy pulps, the addition of sulphuric acid assisted settlement at the start by reducing the viscosity of the medium and throwing down the gel form of the colloid, but in each instance we notice a perceptible increase in retardation as the solids settle as compared with the settlement of the same pulps where no electrolyte was used. In this figure, 1 a and 1 b, 2 a and 2 b would certainly appear to be in accordance with Mr. Ashley's explanation, but 8 a, 8 b, and 8 c are still stronger arguments pointing to the mistake of considering a slime-pulp in the light of a medium. In slime settlement one has to consider



the differentiation of the solid and liquid components of a pulp-mass, and it is this differentiation which would appear to preclude the possibility of accepting viscosity of medium as a prime factor in the question of settlement. In other words, the criteria affecting viscosity of clay slips and settlement of slime from slime-pulps are not identical. A clay slip is poured more readily by preventing the precipitation of the colloid. A slime is settled by stiffening the pulp. We are thus brought to the consideration of what it is that constitutes a slime from the point of view of the metallurgist, and in attempting any definition it will be at once seen that the viscosity of the medium is an all important factor. The following dual classification of slime is tentatively submitted: (1) In connection with concentration practice: slime is solid matter in such a fine state of sub-division that the viscosity of a medium in which it is suspended is able to retard the velocity of its settlement by imparting to it a virtual specific gravity less than normal.

(2) With relation to cyanide practice: 'slime' expresses a condition of finely divided solid matter by virtue of which a sufficient amount of friction is set up with a liquid surrounding it to reduce the relative mobility of the solid and liquid particles below the economic demands of settlement or percolation.

In regard to settlement of slime it may be said that whether the force opposed to gravity be due more to viscosity of medium or to electro-static repulsion, retardation of settlement clearly follows

accumulation or concentration, and thus it is seen that the settlement of slime may be assisted by obviating this accumulation, in the way of removing slime, as it settles, from the bottom of a settling tank.

HORACE G. NICHOLS.

Ymir, British Columbia, August 8.

Continuous Revolving Slime Filter.

The Editor:

Sir—An editorial note in your issue of July 10 referring to the utilization of the continuous revolving filter in South Africa states that this system was first introduced into American practice by Bertram Hunt only a year ago, and further, “it is pleasing to note this recognition of a meritorious innovation in cyanide work.” I desire to claim a share in the suggestion of what you are good enough to denominate a “meritorious innovation in cyanide work,” and believe that I am justified in claiming to have proposed the first continuous revolving filter for which letters patent were issued to me in 1905. The device was described in the MINING AND SCIENTIFIC PRESS of February 9, 1907, and was the first, so far as I am aware, to provide, among other things, for a continuous flow of pulp on to a horizontally moving filter medium, immediately beneath which was a plurality of compartments, the whole revolving around a central valve so arranged that the compartments were under the influence of vacuum during the greater part of the revolution and afterward were brought into communication with compressed air or air at normal pressure under which the cake was scraped off by means of a stationary scraper, the cleaned filter then passing immediately under a fresh charge of pulp.

Duties of another character on the Eastern coast have so fully occupied my time that active operations looking toward the manufacture and sale of the machine have been delayed, arrangements have been perfected, however, by which it is expected that it will be now put upon the market.

EDWARD PARRISH.

Newport, Rhode Island, August 5.

Abbreviating Code Messages.

The Editor:

Sir—I beg to submit to those who must waste their substance on code telegrams and code cablegrams, a method of reducing the number of words without abbreviating or fogging the message. This method of condensing can be used only with numbered codes. By the use of the following tabulation, or any other made up of two-letter pronounceable combinations, two numbers representing two phrases are made over into one word of 10 letters. Of course, where a code is compiled with words of only 5 letters each, this scheme is unnecessary, since two such words can be sent as one. If it is desired to change the tabulation given, the change should follow some system or regular sequence. This is because otherwise the translator of the message finds difficulty in placing the pairs of letters. Note that, with only one exception, in all the pairs of letters the vowel is first.

With this in mind, errors of transmission can be detected at a glance and corrections requested, without waiting to translate the message. A convenient way of writing and translating such cipher messages is shown. In sending, the phrases with their respective numbers are first written in columns. The cipher words are then added as constructed. It cannot be too forcibly urged that all such messages should be typewritten. The unfortunate operators have no means of deciphering poorly written words of such outlandish appearance.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
|---|----|----|----|----|----|----|----|----|----|----|
| 1 | ab | ac | ad | af | ag | ah | aj | ak | al | am |
| 2 | an | ap | ar | as | at | av | aw | ax | ay | az |
| 3 | eb | ec | ed | ef | eg | eh | ej | ek | el | em |
| 4 | en | ep | er | es | et | ev | ew | ex | ey | ez |
| 5 | ib | ic | id | if | ig | ih | ij | ik | il | im |
| 6 | in | ip | ir | is | it | iv | iw | ix | iz | ob |
| 7 | oe | od | of | og | oh | oj | ok | ol | om | on |
| 8 | op | or | os | ot | ov | ow | ox | oy | oz | ub |
| 9 | ue | ud | uf | ug | uh | uj | uk | ul | um | un |
| 0 | up | ur | us | ut | uv | uw | ux | uy | yz | zu |

EXAMPLE.

| | | | |
|------------|---|-------|------------------------------|
| isacaberop | { | 46211 | Send by freight |
| | | 13418 | care of |
| brown | | | Brown |
| abefepepaf | { | 11432 | cam shaft to be — inches |
| | | 42441 | six inches diameter |
| agageparoz | { | 51512 | 8 ft. 3 in. long |
| | | 43298 | for five stamps |
| enebadader | { | 14133 | Blanton self-tightening cams |
| | | 13134 | draw for amount of invoice |
| anfibbon | | | May 1. |

Nothing in this is to be understood as promising a more speedy transmission or delivery by the telegraph company. I have not patented the scheme.

MARK R. LAMB.

Milwaukee, Wisconsin, July 31.

Slime Concentration.

The Editor:

Sir—I have read with keen interest the subject of possible improvements in slime concentration contributed by ‘C.’ in your issue of August 7, and, thinking perhaps the experiments and results I obtained from a simple device for increasing the amount of mineral saved from Frue and Johnston belt-concentrators might be of value to all mill-owners, I request the opportunity of setting forth matter pertaining thereto.

This device is a clear-water distributor for belt-concentrators, designed to remedy the defects of distributors furnished by the manufacturers. It consists of an ordinary distributor-box of the size and shape usually found on vanners, but instead of having vertical channels or metal-launders for distributing the water I used a small brass valve of the pet-cock style, by some manufacturers termed ‘end-valves’, placing them equidistant on the face of the box, midway between the top and bottom, in the spaces formerly occupied by the channels. A tight and permanent insertion was made by boring the

holes $\frac{3}{32}$ in. smaller than the diameter of the threaded end. I then placed a strip of wood $\frac{1}{2}$ by 3 in. wide in the centre of the box the whole length of the box, recessed at each end, the bottom-edge inclined about 15° toward the face of the box, thus providing a partition, the bottom-edge being within $1\frac{1}{2}$ in. of the bottom of the box. At the end of the box opposite from the clear-water feed I placed a short $\frac{1}{4}$ -in. nipple, about 3 in. long, inserted in the back partition near the top, about 1 in. below the top. I also put on an ell and a short nipple on the outside end, leading downward into a small funnel, placed in the end of a $\frac{1}{2}$ -in. discharge pipe leading to the tailing launder, or to a sump-box, so that it could be returned to the clear-water tank to be re-used. I allowed a gap of 3 in. between the bottom of the nipple and the funnel, so that the overflow could be observed from all parts of the vanner floor.

The chief value of this device is an absolutely even pressure of water in all parts of the box, and the elimination of currents; also it equalizes any variation in the flow from the clear-water pipe-line. This is accomplished by allowing an excess of clear water to enter the box, feeding all the valves, no matter how wide they are open, and overflowing to the tailing. The value of the partition lies in clarifying the water, and freeing it from small chips or other debris, and by placing a small piece of 10-mesh screen vertically in the box close to the overflow, the debris will be drawn there and may be removed periodically. This arrangement may be placed on any vanner now in use without disturbing any piping or other devices, and once tried its value will be immediately recognized.

The first cost is greater than the other types of distributor-boxes, but the increased saving is apparent in the first 24 hours. It involves the purchase of a number of small end-valves, but the added carpenter work and small pipe-fitting labor can easily be accomplished by the average concentrator-hand during his spare time. Aprons may be placed on an incline below the box so that the flow may be let onto the belt, and these may be of any design suited to the pulp. Whether they are suspended close to the belt or somewhat higher makes no difference with the distributor box described. In adjusting an individual valve on this distributor it is not necessary to change any of the others to compensate for the increased or decreased flow from the valve so changed. Furthermore, in practice, I found that by setting the valve on the supply-pipe to flow an excess over the amount required for the tailing containing the maximum of mineral, thenceforward no change was required in the supply-valve, and in case of a shut-down or sudden stoppage of supply water, when the mill started up again, and the water again flowed, it was not necessary to go over the supply-valves and regulate them. Of course in some camps where clear water is at a premium there is a slight added expense for returning the excess of clear water, but this is offset by the value of a complete control of the clear water from the distributor, inasmuch as no excess of clear water reaches the belt.

FRANK R. PORTER.

Sodaville, Nevada, August 8.

Co-operative Topographic Surveys.

The Editor:

Sir—I am desirous of making some comment regarding the recently adopted policy of the United States Geological Survey in co-operative topographic surveys. The Geological Survey of New Jersey is not affected by this ruling, our co-operative topographic work having been completed about 1887, hence I have not the same personal interest in its application as some State geologists. As to the wisdom of adopting a definite policy there can, it seems to me, be no question. The authorities of each State can now determine with some degree of certainty how much money can be used in topographic work. The embarrassment heretofore caused by inability to use an entire appropriation after it had been secured from the Legislature on the basis of a 'dollar for dollar' co-operation will be removed. The State surveys can now estimate more accurately than before how much they can use in co-operative topographic work. This is certainly an advantage. As to whether the details of the policy adopted are the best possible, there may be difference of opinion, but it must be conceded that the Federal survey owes some topographic work to every State in the Union, irrespective of whether it is co-operating or not, and that the debt to the public-land States, where the Federal Government is a large land owner, is pressing. It would seem fair that in the distribution of topographic work in States which have no public lands, some advantage should be given those States which are ready to contribute to this survey, for in this way much more territory can be mapped for the same amount of Federal money, and the completion of the Atlas of the United States would be realized the sooner. I think, too, that it must be conceded that in distributing the funds available for co-operative work preference should be given to those States which have the smallest area surveyed, since it is apparently impossible to accept all the offers without change. It does not appear from the Director's statement whether non-co-operating States, having no public lands, will receive any allotment this year. If they do not, and this is a part of the policy to be followed in succeeding years, it can readily be believed that the new plan will not meet the approval of those State surveys.

HENRY B. KUEMMEL.

Trenton, New Jersey, July 12.

Taberg is a mountain in Smaaland, near the southern end of Lake Wetter, in Sweden. It is a classic locality for geologists on account of its remarkable deposit of magnetic iron ore, which is a segregation from a basic magma. The intrusive rock consists of magnetite, olivine, labradorite, and pyroxene. This rock is called hyperite. The segregation contains 31% metallic iron. Posepny disallowed the conclusion that the ore was a segregation, but most geologists now accept the theory of its formation as originally propounded by Toernebohm.

Each geological horizon has some distinctive lithologic character, showing that the main earth-changes have been due to world-wide causes.

ALL-SLIMING.

Written for the MINING AND SCIENTIFIC PRESS
By E. M. HAMILTON.

In articles on the cyanidation of silver ores one often reads statements to the effect that the finer the ore is ground the higher the extraction of silver, and that it is now generally admitted that the all-sliming method is the only one for silver ores. Such generalizations as these are, I believe, open to question. Doubtless there are ores in Mexico and elsewhere which need to be slimed in order to give the best commercial results, but in my experience they are in the minority. Even in cases where total sliming will yield the highest extraction it does not therefore follow that that method is commercially the best, and there are instances where even with all-sliming the extraction is no better than that obtained by a separation of sand of a suitable degree of fineness, followed by leaching and agitation respectively.

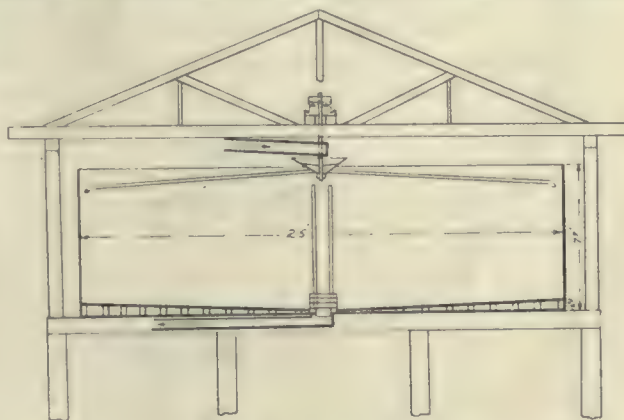
It is not the function of the metallurgist to transfer without question from the laboratory to the working plant theoretically perfect chemical methods, but rather to combine the qualities of the chemist with those of the man of business, and so to modify theoretical ideals as to obtain the best commercial result. At the present time 'all-sliming' is a common phrase among mining men, and yet, how many of its advocates are putting it into practice? I may here state that for the purposes of this article, I mean by 'slime' everything that will pass a No. 200-mesh laboratory screen. How many so-called all-sliming plants produce a pulp all of which will pass a No. 200-mesh screen? If there are any, it would be interesting to have some figures on the cost of production.

I know of two companies which had mills running on the all-sliming system where the sand coarser than No. 200-mesh amounted to 15 up to 20%. I know of another company running on the all-sliming system where the sand coarser than No. 200 reached 20 to 35%. Such work as this is not all-sliming. Moreover, I maintain that it is bad metallurgical practice, because it is an attempt to treat two different products jointly by a process suitable only to one of them. Even where the method of agitation is such as to admit of sand and slime being cyanided together without detriment to the machinery, it yet seems obvious that a treatment which will suffice for the slime, in point of time and cyanide strength, will be inadequate for the sandy portion, whereas if treatment be adjusted to the requirements of the sand, then unnecessary time, power, and cyanide is expended on the slime.

Sound practice would seem to demand one of two alternatives: (1) an actual grinding of the entire ore to pass No. 200 mesh, and treatment by agitation; or, (2) a modified scheme of re-grinding to reduce the sand to a size shown to be suitable by careful experiment, and then an elimination from the pulp of all material which will not pass a No. 200-mesh screen, followed by leaching, leaving only material finer than No. 200 for the agitators.

As regards the first alternative, there are undoubtedly cases where the extraction increases almost in proportion to the degree of comminution, and on such

ores there is a strong argument in favor of a genuine sliming of the whole, though even here it is not enough to know that a higher extraction will result; the question is, will the additional extraction so obtained more than pay the additional cost? Those who have had to do with reducing ores to a fine state of subdivision will know that the difficulties and expenses rise as the ore gets finer, and as more of the finished material is eliminated, until it is almost impossible to carry the matter to completion. The first thing to separate is of course the natural slime and fine silica in the ore; next, the most friable portions will yield to disintegration, and so on, until there seems to be left a residuum of the toughest and most refractory material. This latter will circulate round and round the milling system, only a small part being eliminated each time as a finished product. Thus the question arises, does it pay to try to reduce this 20 to 30% to a state of slime, even if experiment shows a higher extraction to be obtainable by so doing? This is a serious question, and can of course only be determined for each individual set of circum-



Arrangement of Vat and Distributors.

stances. If, however, it should be finally decided that that it does not pay, why carry on the subsequent cyanidation as if all-sliming were really the method in use, instead of frankly admitting that a varying proportion of the pulp is not slime, and treating that portion in the way most suitable to it?

Coming now to my second alternative, namely, a modified scheme of re-grinding, followed by the removal of everything that is not slime, and a treatment of the two products by separate methods—the two companies already referred to as aiming at an all-slime pulp, though with indifferent success, finally decided to abandon the attempt, and while still continuing to produce a fine material in their tube-mills, separated what would not pass No. 200 mesh, and erected a leaching plant for treating it. The result was that, with the same crushing units, and with no increase of power or expense, they were able to increase the tonnage 50% or more without decrease in the total extraction. In another case the elimination of the percolable portion of the pulp, besides affording the possibility of increasing the capacity of the mill and cyanide plant, yielded a higher total extraction than when treating the whole as an agitation product, and incidentally showed a saving of about 40 cents per ton in costs for power, filtration, and cyanide.

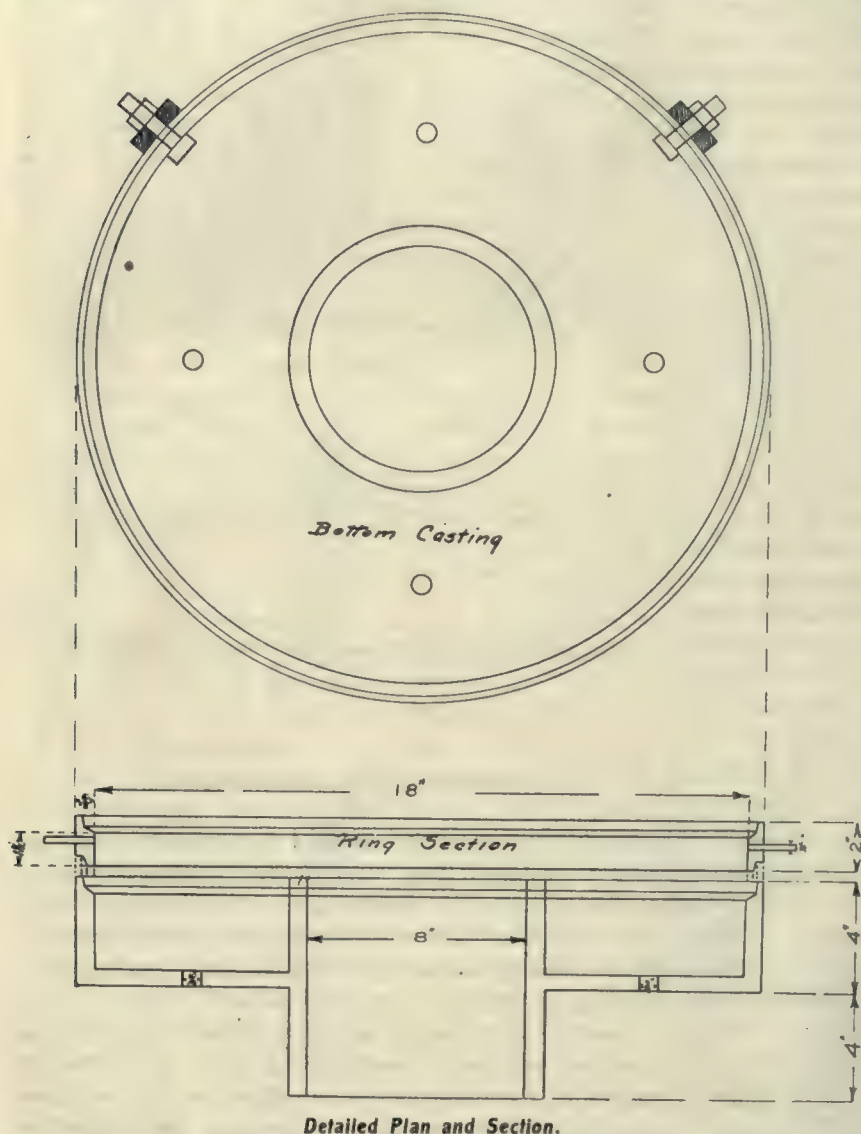
In what I have said I am not comparing the old

method of leaching the sand and agitating the slime with the later one of sliming, or trying to slime, everything. Most silver ores probably give an increased extraction with increasing fineness up to No. 100 mesh, and a few up to No. 200. A later method than either of these is to use a modified re-grinding, aiming in the one case to get as much as possible through the No. 100 screen, and as little as possible finer than this, and in the other to get as much through No. 200 as can be cheaply and conveniently done, but in each case to remove from the pulp every-

never be removed by gravity percolation; (4) it is usually advisable to use the vacuum also during the leaching treatment for purposes of aeration, and for finally drying the charge before dumping, for the same reason as given under (3).

I will here describe an appliance I have used successfully for collecting clean charges of extremely fine sand in the cyanidation of silver ores, and especially where milling is done in solution. It is a circular vat which might presumably be of any desired diameter, though I have never used one larger than

25 ft.; where the sand is especially fine it is probably better to use a smaller size, say 10 or 12 ft. diam., as this seems to afford better control of the quality of the charge collected; and to use two, or even three, simultaneously, as may be necessary. This vat has a circular central discharge overflow, of about 2 ft. diam. for a 25-ft. vat, and 1 ft. for a 10 or 12-ft. vat. The pulp is fed into an appliance resembling the ordinary Butters & Mein distributor, except that instead of the pipes being all of different lengths, they are all equal, and extend to within two or three inches of the periphery of the vat; at their extremities they are bent to about a 45° angle, so that they will discharge the pulp against the side of the vat and at the same time afford sufficient power to rotate the distributor. The pulp runs down the side of the vat without any splash, and the sand builds itself up on the bottom in the form of an inverted cone, while the solution and slime flow over the inclined surface and away through the central opening. As the level of the sand rises, the overflow is built up with cast-iron rings 1 or 1½ in. deep, until the vat is full. The distributor is of course suspended from above, and works on a ball-bearing. The rings



Detailed Plan and Section.

thing that will not pass No. 200, and then treat the two products separately by the method best suited to each.

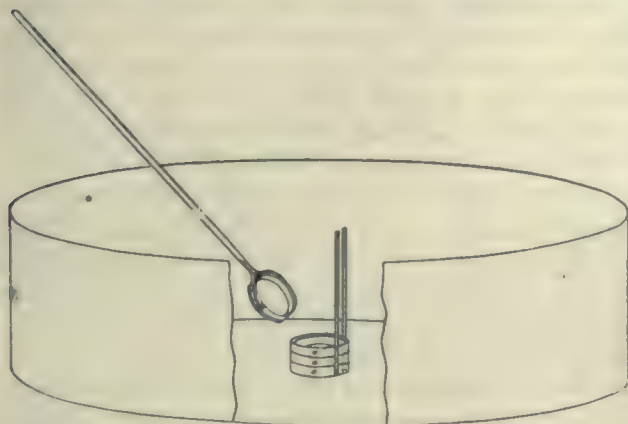
The reason why the leaching treatment has been apparently unsuccessful in some cases where fine-grinding is practised is probably because a good separation of sand from slime has not been obtained. In order successfully to leach a fine sand composed of material ranging from No. 100 to 200 mesh, the following conditions should be obtained: (1) a clean separation, with a minimum of impalpable slime present in the sand; (2) a thorough disintegration of the sand while being transferred from the collecting to the treatment vat; (3) as an almost necessary precedent to (2), a drying out of the collected charge by vacuum before transferring, because the fine sand retains an excessive quantity of moisture, which can

be lowered into place from the platform which sustains the distributor. They are fitted with small iron pegs, one on each side of every ring, and a semi-circular piece of iron, with a hook on each point, and a long handle, is slipped under the pegs; the ring is lowered into place, and the appliance withdrawn. The edges of the ring are offset so as to fit into one another, and thus obviate possible leakage of sand. There are two vertical bars of iron bolted to the casting of the discharge-hole, which act as guides in the placing of the rings. The whole arrangement will be easily seen by a reference to the drawing.

It will be observed that the principle of this collector is entirely different from that of the Butters distributor vat; in the latter the lengths of the pipes are so designed as to distribute sand over the whole area of the bottom, as far as possible, while the splash

is largely depended upon to keep the slime in suspension till it reaches the overflow gates at the periphery of the vat; in the pulp here described the sand settles first at the periphery and the slime rolls over the surface of it till it reaches the outlet. There is never more than a film of solution and slime covering the sand, except for a short distance around the overflow every time a new ring is lowered. To avoid a layer of slime depositing on the filter mat before the sand has formed its own angle of inclination toward the centre, the filter-bottom is made slightly conical.

Sand collected in this way does not pack as it does with the ordinary method of distributing; it occupies more space for a given weight; and when well drained falls apart under the shovel, forming a minimum of obnoxious lumps which are so detrimental to good leaching. When the sand to be collected is exceptionally free there is a tendency to agglomerate even with this system, and it is advisable to transfer to the treatment-vats by means of a belt and tailing-stacker to get the charge thoroughly disintegrated and



Device for Placing Rings.

mixed. Incidentally, this appliance forms an excellent slime concentrator, holding back in the sand all but the finest concentrate in the slime, and giving it the advantage of the extra time and cyanide strength, which it would not get in the agitator vats.

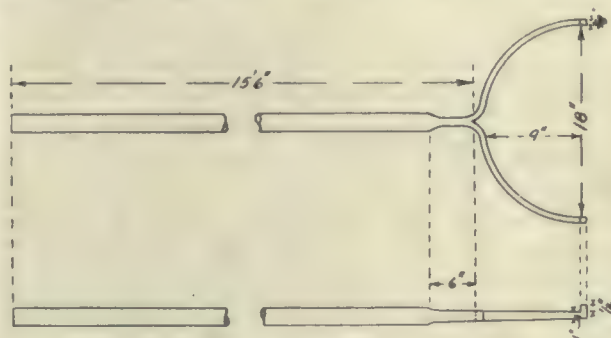
The method of deposition of the sand in this collector is similar in principle to that of the South African 'nigger with a hose' system, with the added advantages of making a cleaner separation, being almost automatic, and having greatly increased precision and regularity. The following are some screen-analyses of material collected in these vats:

| Mesh. | | No. 1, % | No. 2, % | No. 3, % |
|------------------|-----|-------------|-------------|-------------|
| Over | 60 | 21.6 | 5.1 | ... |
| Under | 60 | 22.8 | 15.3 | 2.9 |
| " | 80 | 17.2 | 16.0 | 11.6 |
| " | 100 | 19.9 | 41.2 | 36.8 |
| " | 200 | 14.8 | 17.7 | 43.9 |
| Impalpable slime | | 3.7 | 4.7 | 4.8 |

In No. 1 the sand was collected in a 25 ft. diam. vat; milling was in cyanide solution; and protective alkalinity was 0.1% in terms of caustic soda. A cone classifier was used to remove part of the slime prior to delivery in the collector. In No. 2 the sand was collected in a 10 ft. diam. vat; milling was in cyanide solution; and protective alkalinity was 0.125%. Here also there was a partial removal of the slime by cones prior to delivery in the collector. In No. 3 the sand

was collected in an experimental vat 3 ft. diam.; milling was in cyanide solution; and protective alkalinity was 0.15%. The pulp was taken direct from the mill-laundry without previous classification, and no return 'spitz' was used to trap the sand which might have escaped from the collector. The charge of slime separated from this sand only carried 3% of sand coarser than No. 200 mesh.

These three examples are from different mines treating diverse kinds of ore. No. 3 will illustrate the possibilities of this method of separation. The resulting charge of sand, when transferred, percolated by gravity at the rate of $1\frac{1}{2}$ in. per hour through 3 ft. in depth, during a period of 14 days treatment. I believe that as a separator and collector of exceptionally fine sand in a highly alkaline pulp the device described is unsurpassed by any method at present in use. I have not patented it, because, while the application to collection of sand for cyanide leaching is, as far as I know, original with me, yet the principle is that of the old Cornish concave buddle fed by a modified form of Butters & Mein distributor. I have described it at some length, in the hope that it may meet the needs of other workers who



Ring-Shifter.

have been confronted by the necessity of fine-grinding and who yet recognize the difficulty and expense of all-sliming.

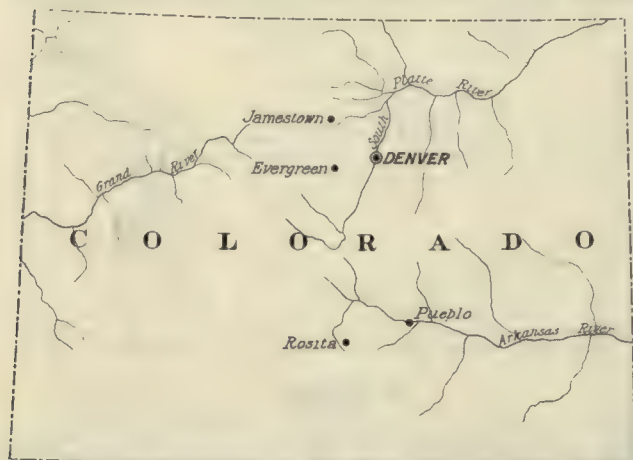
The Taylor Peak and Whitepine iron-ore deposits of Colorado are described by E. C. Harder in an advance chapter of the U. S. Geological Survey's Bulletin 380. The Taylor Peak district is in the eastern part of the Elk mountains, on the boundary between Pitkin and Gunnison counties. The nearest town, Ashcroft, in southern Pitkin county, is about three miles south of the principal deposits. The ore deposits are on the north, east, and south sides of Taylor peak, about 10 miles west of the junction of the Elk and Sawatch ranges. They are all above timber-line, ranging in elevation between 12,000 and 13,000 ft. The largest single deposit is on the north slope of Taylor peak, at the head of Cooper creek. It has an average length of about 750 ft. and an average width of about 450 ft., and has been estimated to contain between 3,000,000 and 4,000,000 tons of ore. The Whitepine district lies on the west slope of the Sawatch range about 10 miles north of Marshall pass, in the southeastern part of Gunnison county. It is readily reached from Sargents, on the narrow-gauge line of the Denver & Rio Grande railroad, at a distance of 12 miles. The principal ore deposits lie on the east slope of the valley of Little Tomichi creek.

FLUORSPAR IN COLORADO.

Written for the MINING AND SCIENTIFIC PRESS
By ERNEST F. BURCHARD.

*The fluorspar deposits of Kentucky and Illinois have received considerable attention from mining men and geologists. Little, however, has been published regarding the Colorado deposits. The following notes based on a hasty reconnaissance by the writer in September, 1908, may, therefore, be of some interest.

In Colorado and other Western States fluorspar occurs commonly in small quantities in connection with metalliferous veins. In eastern Colorado, in a narrow belt extending more than 150 miles from north to south, just within the front range of the Rocky Mountains, from Boulder county on the north to Custer county on the south, fluorspar occurs in considerable quantities. In several places it forms the major part of the filling of certain fissure veins in which the metalliferous minerals are practically of negligible quantity. The fluorspar veins,



Map Showing Fluorspar Localities.

where studied, cut granites and gneisses of pre-Cambrian age that have been intruded by later dikes, many of which are of quartz porphyry.

The fluorspar industry in Colorado is yet in its infancy. In milling the precious metal ores some fluorspar is obtained in the tailing. But little of such spar can be saved. Where the veins are wholly of fluorspar and thick enough to yield an important tonnage, attempts have been made to mine the spar itself, although with but little mine equipment. All the deposits thus far worked are situated 12 to 16 miles from a railroad. Much of the spar, heretofore, produced has failed to fulfill the requirements of the market on account of the presence of wall-rock and vein materials which are difficult to separate without special machinery. Gravel spar is the only grade that can be prepared by hand-cobbing and sorting. The lowest grade of spar acceptable must contain at least 80% CaF_2 , with silica less than 15%. There is at present a local demand for more spar than can be produced in the State at the present rate. Colorado spar is fairly free from ob-

jectionable sulphides, and the basic open-hearth steel plant of the Colorado Fuel & Iron Co., at Pueblo, consume practically all the output of the State, and about twice as much more which is brought from Illinois and Kentucky. The price paid for Colorado spar is \$6 per short ton for spar that carries 85% CaF_2 , f. o. b. cars at Boulder, Morrison, and Westcliffe. A premium of 20c. per ton for each per cent of CaF_2 above 85 brings the price of 90% spar up to \$7 per ton, and a deduction of 20c. per ton for each per cent of CaF_2 below 85 reduces the price of 80% spar to \$5 per ton.

Simple and economical methods of cleaning the spar, and better transportation facilities, are the things most needed by the fluorspar industry in Colorado. There seems but little prospect of bringing railroads any nearer to the present working properties for some time, but discoveries of new deposits of fluorspar nearer to railroads are likely to follow. The general improvement of wagon-roads would be possible and beneficial.

The principal materials that must be separated from the Colorado fluorspar in order to raise its grade are quartz, clay, granitic rock from walls and breccias, and silicious gouge—in general silicious and aluminous materials whose specific gravities are a little lower than that of fluorspar. It would seem feasible to raise the grade of most of the Colorado material at least to the minimum limit, and of the best grade to at least 90% CaF_2 , by the application of some of the simpler cleaning processes now employed in the Kentucky-Illinois district. The problem in Colorado is to save only the fluorspar (except in rare instances where ores of lead, copper, zinc, or the precious metals may be present), and to put quartz, feldspar, sand, rock, clay, etc., into the tailing. The differences in specific gravity (fluorspar 3.13, quartz 2.65, feldspar 2.7) are relatively slight; therefore, the most perfect separation would involve a practically perfect sizing system of screens and jigs. Such elaborate equipment is out of the question at present in Colorado for several reasons, chief among which are (a) the quantity of spar in sight does not warrant large operations; (b) water is not abundant at most of the fluorspar prospects, and washing operations probably could be carried on only during part of the year; (c) the cost of haulage is so great as to cut down profits to such a low margin that returns on large investments could hardly be realized. A much cleaner product, however, might be procured by coarsely crushing the spar, running it down a gravity washer or through a log washer to remove the clay and sand, and subsequently picking out the large fragments of quartz and rock. The picking could be done on a table or belt. One such outfit would suffice to handle the whole output of each district in the State.

There are three localities in Colorado where fluorspar is produced for the market, namely, at Jamestown, Boulder county; at Evergreen, Jefferson county; and near Rosita, Custer county.

At Jamestown the country rock is generally granitic, of pre-Cambrian age. The granite is intruded by several dikes of quartz porphyry, which carries

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fluorite in quantities ranging from a trace to 30%, and is cut by many true veins, in which the vein material is principally crystalline fluorspar, with crystalline quartz and pockets of decomposed silica and feldspathic clay. There are veins carrying quantities of sulphides and tellurides also in the vicinity, but these are not worked for fluorspar. The fluorspar veins here are notable for their lack of metalliferous minerals. The mineralized zone that carries fluorspar in abundance extends northwest-southeast for about 2 miles, with Jamestown near the middle. The width of the zone is about one-half mile. The valley of Jim creek cuts through this area and affords out-crops of the fluorspar veins and other mineralized dikes and veins. Within a radius of one mile from the centre of the village there have been located ten or more groups of claims on which fluorspar veins appear to be abundant. The fluorspar veins occupy fissures, and the walls and vein material seem to have suffered some modification by movements which have resulted in the brecciation of the material to some extent. The wall and vein materials are thus more or less intermixed, and the veins appear to be faulted in places so as to be offset. The fluorspar veins range in width from a few inches to 15 ft. Veins less than 1 ft. wide can hardly be worked profitably, and there are few that exceed 6 ft. Thicknesses greater than 6 ft. are generally due to local swellings or to intersections of two or more veins. The usual width of the veins is from 2½ to 5 ft. The fluorspar veins according to strike fall into two groups, those striking northeast and those striking northwest, the former group predominating. The veins are nearly vertical, or dip at angles of 75° or more. The veins show faint banding or ribbon structure, but this in many cases has been obscured by brecciation.

The fluorspar in this locality is generally dark-colored, ranging from greenish brown to dark purple, although there is some light-colored, fairly clear, glassy spar obtainable. A singular characteristic of the dark spar is that on exposure to sunlight and air the darker color bleaches to pale purple, light blue, or white in a few months. This is true of the spar on the surface of outcropping veins, as well as of mined material thrown out on stock piles. The spar that has been opened is mostly near the surface and it is generally much fractured, rather porous, and somewhat brecciated. The cracks, pores, and cavities are filled with decomposed quartz and feldspathic material, and this, together with the vein quartz and wall material which is necessarily included in mining, greatly reduces the grade of the spar. The material as mined, carries 70 to 85% CaF_2 .

Among the more important fluorspar properties at Jamestown may be mentioned the Blue Jay group of claims owned by Joseph Bergheim and William Brown. At the Blue Jay there are two adits, the upper about 100 ft. long and the lower about 90, each in ore for about 75 ft. The vein is 4 to 5 ft. thick, strikes N. 70° W., and dips at an angle of about 70° toward the northeast. The vein lies between walls of decomposed, grayish, granitic rock,

and within the vein are pockets and crystals of feldspar and quartz. The spar is dark purple without marked vein structure. The material is much fractured and shows seams of iron oxide. When struck with a hammer in the dark, the ore shows phosphorescence. There are several other veins in the vicinity running parallel to those which are cut by the adits. One of these veins is reached by a shaft. At the top this vein shows 2½ to 3 ft. of spar, and it is reported to widen to 10 ft. or more at the bottom of the shaft, 112 ft. deep. The vein pitches steeply to the west and the shaft follows the vein. The water level lies at about 40 ft. below the top of the shaft.

The Yellow Girl property contains a vein now nearly worked out, but which once yielded 1700 tons of spar to 5 men working 27 shifts. There was an unusual thickness of ore, 6 to 12 ft., in the veins in this property. This extreme width was due to a pocket; the vein where widest is sheeted, giving the spar the appearance of a bedded formation, especially where some spar is left to form the cap over the entrance to a short adit. The wall-rock at this place is granite, and there is much quartz associated with the fluorspar in the vein. There are also pockets of amorphous, silicious material resembling tripoli. At the end of the adit, the ore is apparently cut off by faulting against a wall of decomposed gray granite containing much pyrite.

The Emmett mine has opened a vein which shows a thickness of 6 to 15 ft. The maximum thickness occurs at points where the vein apparently forks. The main vein strikes N. 70° W., and dips steeply toward the northeast. The spar is mostly of a dark purple color, but there is some white to pale green, translucent, practically pure spar. The workings here consist of surface cuts some 50 to 60 ft. long, and an adit 85 ft. long stoped overhead to heights of 8 to 20 ft. The rock is moved by hand trams and dumped into a chute, which conveys the material to a bin at the roadside 160 ft. below. The owner of this property is William Brown, who owns also the Invincible mine (a producer of sulphide ores), which lies almost in the strike of the fluorspar lead. Other properties of promise are the Early Bird prospect and the Tip Top claim owned by C. E. Beach; workings owned by John Evans; and the Lookout lode, which formerly was worked as a gold prospect.

Although mining of fluorspar has been carried on near Jamestown for 6 years, the development work thus far accomplished consists mainly of surface cuts and adits not more than 100 ft. long. Much of this work has simply been done as assessment work. Overhead stoping from the adits has opened the spar in places to vertical distances of 30 ft. As already mentioned, one shaft has been sunk on a fluorspar vein. It is reported that this shaft is 112 ft. deep, that from it levels were driven north and south on the vein at depths of 50 and 100 ft., and that the spar has been mined out to the second level by overhead stoping. In September, 1907, this shaft was partly filled with water. All the fluorspar workings here, except this shaft, are well above the level of ground-water and are easily drained.

The statistics of production of spar from Colorado were not obtained at the beginning of the industry, so it is probable that considerably more spar has really been mined from here than has been recorded by the United States Geological Survey. The Colorado returns date back to 1905 and total less than 6000 tons. The total quantity produced in the Jamestown district, according to rough estimates made by men familiar with the locality, amounts to about 8700 short tons. On the majority of claims only assessment work is done from year to year, the crude spar which is mined being hand-cobbed or perhaps hand-screened and allowed to accumulate until the weather and roads are favorable for hauling. The product is of the grade known as 'gravel' in Illinois and Kentucky. The spar must be hauled to Boulder, a distance of $13\frac{1}{2}$ miles by road, which is mostly down-grade. The cost of hauling is about \$3 per ton.

Near Evergreen, Jefferson county, along Bear creek, is an area of pre-Cambrian granite-gneiss, in which fluorspar occurs in true veins, associated with minor quantities of lead, zinc, and copper minerals. Besides the veins in which fluorspar is the major constituent there are quartz veins carrying minor quantities of fluorspar as well as metallic sulphides.

On the northwest side of Cub creek, a branch of Bear creek, at a point about $\frac{3}{4}$ mile southwest of Evergreen postoffice, a prospect has been opened by R. P. Blakeslee on a fluorspar vein, ranging from $1\frac{1}{2}$ to $4\frac{1}{2}$ ft. thick, and averaging $2\frac{1}{2}$ ft. of spar. The vein strikes N. 30° W., and dips 70° to the southwest. The vein fills a fissure which cuts across the sheeting of the granite. It is reported to be traceable for about one mile to the southeast and for a greater distance to the northwest. The Augusta mine, formerly worked for ores of copper, is nearly in the same strike about $\frac{1}{3}$ mile to the southeast. The walls of the vein show movement. Strained and mashed biotite-granite occurs between the vein material and the walls of the fissure. Fragments of it penetrate the vein material at the edges. Within the vein there are in places bands of white quartz 1 to 3 in. thick and bands of silicious biotitic rock 3 to 6 in. thick. Along the foot-wall the vein carries small quantities of lead and copper ores. Blende is reported from below ground-water level. The fluorspar is banded parallel to the walls and its color ranges from amethyst to deep purple, from pale to deep green, and in a few places it is greenish yellow. It is mined from hillside open-cuts and drifts on the out-crop, and the vein has been reached also by a cross-cut about 250 ft. long below which a winze about 25 ft. deep was sunk, and from this a lower level was driven a few feet. The spar is mined by hand, hoisted to the surface by windlass, hand-cobbed, the metalliferous minerals saved, and the products hauled $12\frac{1}{2}$ miles, mostly down grade, to the Colorado & Southern railway at Morrison. The haulage costs \$2 per ton.

In September, 1908, mining was in progress, but shipments were suspended owing to washouts on Bear Creek road. Some fluorspar was mined here in the seventies and carted 28 miles to Central City, where it was used in smelting gold and silver. The

present workings were opened in December, 1907. The total product for the year was about 200 short tons. The material is now used by the Colorado Fuel & Iron Co., at Pueblo.

About 7 miles southeast of Rosita, Custer county, near one of the branches of Antelope creek, a vein carrying fluorspar has been discovered, from which some spar has been produced for the market. The rocks in the vicinity are pre-Cambrian granite and gneiss and later eruptives. The fluorspar occurs as a shoot in a fissure vein cutting the crystalline rocks. The vein strikes N. 20 to 30° E., and dips 70 to 75° toward the southeast. The shoot is a well defined tabular sheet of ore, pitching northwest. It pinches and swells locally, and terminates on its lower right hand margin in silicious vein-rock. It is also slightly faulted, as shown in one of the upper workings. The thickness of the vein varies from 16 in. to 4 ft., and the irregularity is more pronounced in the hanging wall than in the foot-wall. The thickness of the spar ranges generally from 2 to 3 ft., and the average thickness of the workable material averages about $2\frac{1}{2}$ ft. Between the wall-rock and the workable spar there is in places a band of brecciated silicious rock 4 to 6 in. thick, cemented by fluorspar, and generally there is also a clay gouge $\frac{1}{2}$ to 6 in. thick. The spar is light green to brown in color, and rarely bluish. It is rather finely fractured and is also jointed. Filling the fracture and joint planes are films and seams of brown, smooth clay, but the material is relatively free from quartz and silicious matter except near the walls of the vein. About one-quarter mile northeast of the out-crop of the fluorspar vein and striking nearly at right angles to the latter, copper-bearing veins have been opened. Fluorspar is present as a minor gangue material.

The property from which fluorspar is obtained here has been worked by J. C. Steiner and D. D. Moninger, and recently the Jocomo Mining Co. has been organized to exploit the property. The workings consist of an adit with two drifts, respectively 80 and 100 ft. above the adit, all driven in the direction of the strike of the vein. There is one additional level 13 ft. below the lower drift. The adit was driven 200 ft. from the outcrop in barren vein material, and the ore-shoot was reached about 50 ft. higher on a raise, driven from the adit. The spar is worked by stoping in the levels and is milled down the raise to the adit, out of which it is trammed by hand to a storage bin. Only hand methods of cleaning the ore are employed, and the product is hauled by wagons to the Denver & Rio Grande railroad at Westcliffe, a distance of about 16 miles, the first 6 or 7 of which are over a rather hilly road.

The fluorspar thus far shipped from the Rosita district has generally been kept well above the standard, as shown by the analyses below. The product, nearly 1000 short tons, has been purchased by the Colorado Fuel & Iron Co., at Pueblo, on the same conditions with regard to grades and prices as elsewhere in Colorado. The same problems confront the producers, namely, the production of a spar which shall carry 80% or more CaF_2 without

a large proportion of waste or a large expense in cleaning and transporting it to the railroad.

| ANALYSIS OF FLUORSPAR (GENERALLY CARLOAD LOTS). | | | | | | |
|---|--------------------|--------------------|----------------------------------|---------------------|------|-------------------|
| Al ₂ O ₃ + | | | | | | |
| Locally. | CaF ₂ . | SiO ₂ . | Fe ₂ O ₃ . | CaCO ₃ . | MgO. | Authority. |
| Rosita, Colo. | 86.75 | 9.3 | 4.2 | .... | ... | Colo. F. & I. Co. |
| | 81.55 | 13.3 | 5.1 | .... | ... | " " |
| | 82.25 | 12.6 | 5.0 | .... | ... | " " |
| | 84.3 | 11.6 | n.d | .... | ... | " " |
| | 60.9 | 27.0 | n.d | .... | ... | " " |
| Jamestown, Colo. | 76.05 | 19.8 | 4.2 | .... | ... | " " |
| | 83.76 | 12.2 | 4.0 | .... | ... | " " |
| | 85.9 | 10.5 | 3.75 | .... | ... | " " |
| | 79.06 | 15.24 | 5.26 | .... | ... | " " |
| | 86.75 | 8.60 | 4.46 | .... | ... | " " |
| Marion, Ky. | 84.25 | 2.98 | 1.28 | 10.28 | ... | " " |
| | 87.8 | 3.10 | 2.06 | .... | ... | " " |
| | 90.02 | 4.72 | 1.5 | .... | ... | " " |
| | 92.7 | 2.5 | 0.64 | .... | ... | " " |
| | 96.01 | 1.9 | 1.88 | .... | ... | " " |
| | 94.72 | 1.22 | 0.98 | 1.82 | 0.68 | Lackaw'na St'l. |
| | 95.63 | 1.32 | 0.93 | 0.38 | 1.22 | " " |
| Fairview, Ill. | 88.85 | 3.4 | 1.45 | .... | ... | Carnegie Steel. |

The more important points brought to notice by this reconnaissance are (a) that the fluorspar deposits are fissure veins that probably extend to considerable depths; (b) that the veins are of moderate thickness as compared with those of the Ohio River, in the Kentucky-Illinois, district, and that the quantity of spar probably does not warrant any but simple and inexpensive equipment for cleaning and concentrating; (c) that the fluorspar is generally free from sulphides and that, although some of the run-of-mine material is acceptable in the crude state, the greater part of it needs some cleaning in order to render it marketable; (d) that there is a steady local demand for more spar than is yet produced in the State; (e) that the geological conditions appear favorable for the occurrence of much more fluorspar than has yet been discovered, and that further prospecting for the mineral is therefore to be encouraged.

Seward Peninsula and the mining conditions there have been described recently in Bulletin 379 of the United States Geological Survey by P. S. Smith, F. F. Henshaw, and A. H. Brooks. The resource of chief value in Seward Peninsula is placer gold, and these reports show that the low-water conditions of 1908 and the approaching exhaustion of some of the ancient rich beach placers considerably curtailed the production. The value of the output of placer gold in Alaska for 1908 is estimated at \$15,455,000, of which Seward Peninsula furnished nearly a third, or about \$5,000,000, as against \$7,000,000 in 1907. The 1908 output of the Peninsula is about the same as that for each year from 1900 to 1905—that is, the same as before the ancient beaches at Nome were discovered. The average production for each placer mine for the year was over \$16,000, a figure which indicates that many of the operations were conducted on a large scale. The average output per placer claim was \$2300; if the men engaged in dead work and prospecting are also included, the average per man was \$1400. These figures are somewhat

higher than those for the whole of Alaska, owing to the fact that many labor-saving devices are in use in Seward Peninsula and that most of the small plants were closed in 1908 for lack of water. Bonanza mining is still dominant in this region, with the result that methods of working low-grade gravels have not been developed as they must soon be if the production is to be maintained. One of the prime necessities in the future progress of the placer-mining industry of Alaska is the guidance of experienced engineers who are capable of solving any problem that may arise in the development of gravels which are not rich enough to allow a wide margin between success and failure.

SAVING GOLD WITH HUNGARIAN RIFFLES.

That gold is readily saved by the Hungarian riffle sluice is shown by the following tests, which at the same time were intended to determine what effect might be produced by varying the amounts of solid matter in suspension in the pulp-stream sluiced. The Hungarian riffle is one with a lip projecting down-stream. The pulp accordingly eddies under



Hungarian Riffle Sluice.

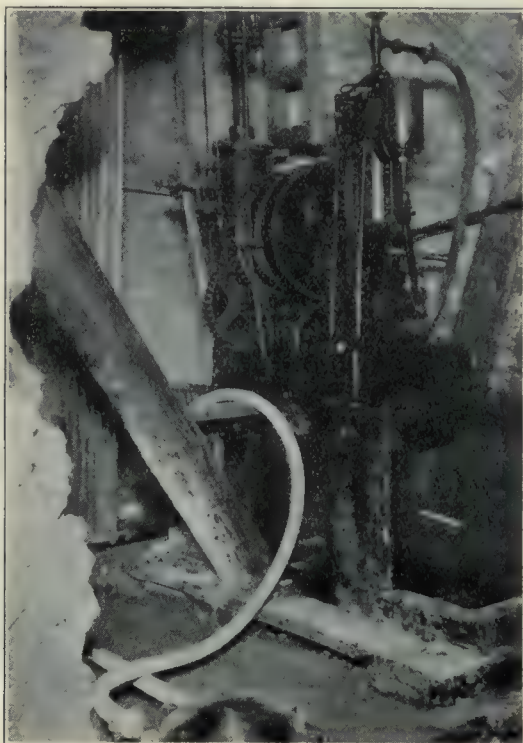
each lip, thus checking the velocity, and giving the gold a chance to settle to the bottom. Each test consisted of 2.52 cu. ft. of gravel and sand into which was thoroughly mixed 814.15 mg. of gold. This was put through a sluice 7 ft. long, 8 in. wide, riffle surface 4 2/3 sq. ft., grade 1 in. to the foot. The water in the first test contained 22.2% solid matter; in the second test clear water was used. The recovery was 80% in the first and 83% in the second test. The ratio of this sluice area to that used on the dredge is as one to three. Since no particular care was taken not to lose the gold the results show a fairly good recovery. The experiment was crude, but suggestive. It is apparently of more consequence to maintain a proper depth of pulp over the riffles, and a proper grade to the sluice, than to preserve uniformity of dilution in the pulp. Those factors bear upon the production of a suitable eddy. It would be interesting to make further tests to ascertain the best shape of Hungarian riffle.

DIAMOND DRILLING AT TONOPAH.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN M. FOX.

In the autumn of 1908 it was decided to put down a vertical drill-hole from the bottom, or 700-ft. level, of the Silver Top mine to gain information regarding the formation through which the Silver Top No. 1 shaft would have to pass if sunk to greater depths. A station and raise were cut close to the shaft and the drill installed. The height of the raise was sufficient to enable the runner to pull in 20-ft. lengths. A suitable sump was cut near by for return-water from the hole, thus permitting the use of the same water repeatedly, with the exception of what was lost in the hole.

The drill was a Sullivan Class 'C', provided with a hydraulic head and chuck for size 'A' rods, capable of drilling to 1500 ft. The engine, drum, and



Sullivan Drill Underground.

head were mounted in the usual manner, on a standard frame, which was held in place by two heavy sprags wedged to the wall of the station. Compressed air at 90 to 100 lb. pressure was used for motive power, it being tapped from a main-line through a 1-in. connection to the engine. As the level is dry, water for the drill was drawn from the water-pipe line in the shaft. Since a 700-ft. head would have provided a higher pressure for the drill than was desirable, a break in the line was made at the 400-ft. level. A large sheet-iron tank was installed at that point, and the supply-pipe from above was provided with a valve that was opened and closed automatically by a float. From the tank to the drill approximately 300 ft. gave about 123 lb. water-pressure, sufficient for the ordinary operation of the feed. In actual running, the hydraulic head was supplied entirely from this source, proving perfectly satisfactory, as it gave clean water at

a constant pressure with no entrained air. The latter is objectionable, giving rise to 'jumping' in the rods, with attendant extra wear on the diamonds. As stated above, the water at the bit is used many times. As it flows from the collar of the hole, it is collected in the sump, and from there pumped by a small duplex back through the rods. The supply, of course, has to be replenished from time to time, as some water is lost.

At the start, the hole was reamed to a depth of 3 ft., and a 2-in. inside diameter pipe wedged in it. This projected high enough above the collar to allow the sludge-board to be placed, when actual drilling began. Size 'A' rods (standard), having an outside diameter of $1\frac{5}{8}$ in., were used. To these were strung a 10-ft., size 'A,' plain core-barrel, straight core-shell for 'Cosette' core-lifter, and size 'A' bit. The latter has an outside diameter of $1\frac{25}{32}$ in. With the carbons having a total offset of $\frac{1}{32}$ in., the diameter of the hole, assuming a perfect bore, would be $1\frac{13}{16}$ inch.

Some trouble was experienced with the 'Cosette' core-lifter on account of the breaking of fingers, due probably to the fact that fragments of rock would wedge between the fingers and the frame on which they were mounted. As the core rose through the lifter, some irregularity on it would tend to force the fingers back against the springs which hold them out toward the centre of the core. Being unable to retreat because of the rock behind them, they would snap off. When a core-lifter is working properly, it would have little or none of the rotation of the rods, but should slip easily within the core-shell. Its relation to the core, when the latter is not broken off to the bottom, should be that of a stuffing-box to a piston-rod. Of course, such a perfect adjustment is unattainable, but it should be as closely approached as possible, otherwise the gripping edges, no matter what type of core-lifter is used, will be rapidly worn away and will lose their ability to hold the core when the time comes to pull.

The diamonds or 'carbon' in use averaged, when new, about $3\frac{1}{2}$ carats each. They were of the best quality, and at the existing market price cost \$75 per carat. Six stones were set in each bit, three inside and three out, with a $\frac{1}{64}$ -in. offset. The life of a new bit varied greatly in this hole; some drilled 35 to 40 ft. before becoming played out, others were retired after drilling only 2 or 3 ft. Many causes contributed to this difference in life. Vibration in the rods causes great wear and tear on both stones and metal. Short-fissured ground makes bad drilling, and variable pressure at the feed, which is hard on the bit.

Too great emphasis cannot be laid upon the advisability of buying the best carbon. Unless one is an expert by reason of long experience in judging stones, the setter should do the picking. There are few arbitrary rules by which a stone can be judged as to its worth. Its shape is almost as important as its quality, and the setter, if he be competent, is certainly the best judge of that characteristic. There are unscrupulous dealers in carbon, as there are in every line, and they have their ways of de-

vided a means of cutting away slight obstructions that might get in the way while lowering the casing for the last time. They were worthless for any other purpose, and hence were left in the hole. From here on, work progressed without serious trouble, occasional soft streaks being cemented; at 411 ft. the water was lost completely; in fact, it ran away so rapidly that the sump was siphoned dry. Sawdust and bran proved ineffectual in plugging the outlet, and until cement was used, the water continued to escape.

Experience gained in cementing sections of this hole may prove of use to others. In the first place, certain brands of cement are more adaptable to this work than others. Those reaching their initial and final set the most rapidly, are obviously the best on account of time saved. The character of the ground being drilled may cause more or less alkalinity in the water. This seems to retard the setting of some cements more than others. In making the mixture it was found that the thicker it was, the better; the limit to which the thickness may be carried, depends upon whether the cement is to be poured or not. For comparatively shallow holes, pouring answers very well; for deeper holes, placing thick cement in paper tubes about 12 to 14 in. long, and dropping into the hole, has been tried with success. Three important things to be observed to secure the best results are these: first, get the hole dry, if possible, by blowing; second, tamp the cement frequently while putting it down, which can be done by plugging the end of the rods and giving them a slight drop on the brake (of course, it takes much more time than simply pouring in the cement and allowing it to set, but the results are more certain, and in the long run, time will almost always be saved); third, if a brand of cement prove unsatisfactory, try others. One can probably be found to do the work.

Vibration of the rods, which is mentioned above, can be greatly reduced, if not eliminated, by coating them with crude petroleum when lowering. This provides a lubricant that clings in spite of the scour of water and sludge.

Record of hole: there are probably as many systems of keeping the log of a diamond-drill hole as there are districts in which such work is being done. The following figures will show one such system, which is really in triplicate. The first record is composed of type specimens selected from each day's run; if the core shows no variation for that day, one piece is taken to represent the rock drilled; any change or changes shown in the hole are recorded by corresponding pieces taken from the core; each piece has painted upon it the depth

it represents. The diagram of the hole is drawn to a vertical scale of 5 ft. to the inch, with the width greatly exaggerated. A plate is made for each 100 ft. drilled; on these plates are recorded depth, formation, assay values, and eventually the petrographic description of the rock, wherever it has been deemed advisable to have slides made, will be added. The ledger record explains itself.

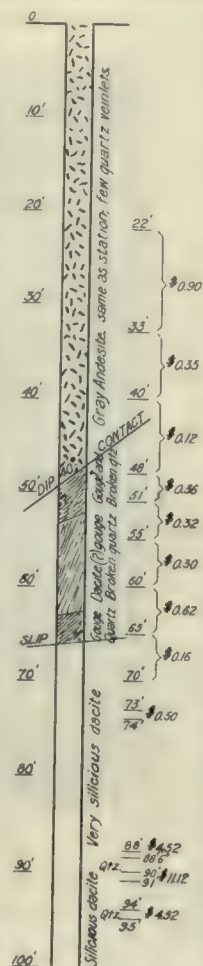
Assays: sludge-samples were taken from every run and assayed. Core samples were taken from time to time as a check, or wherever it was thought necessary by reason of the appearance of the core. It was realized that sludge-samples are only indicative of the presence or absence of valuable material when drilling under such conditions as the above. No reliability can be placed upon them quantitatively for many reasons: for example, a high-grade streak of narrow width would salt a 10-ft. run. If one succeeded in coring the streak and its adjacent walls, reliable information would have been gained in regard to where the valuable material came from, but without such proof, no certainty could be felt as to whether the ore were 10 ft. wide, and low in value, or one or two inches wide, and high in grade.

Costs: to one unfamiliar with conditions in Tonopah, the cost of drilling will seem strangely high. Labor and power, the two main items, probably reach a maximum there, yet in spite of this, in one month when 190 ft. were drilled, the cost per foot was only \$3.50. In calculating costs for this hole, nothing was omitted that should be charged against it, and in fact, in one or two instances, it has borne unjust charges through an imperfect understanding of the conditions. The following list of charges gives an idea of how the cost was arrived at: (1) power (based on the drill's proportion of total air consumption); (2) labor; (3) diamond loss; (4) water (for the first four months only; after that, the 200-ft. level made enough water to supply both diamond and machine drills); (5) assaying; (6) supplies (includes pipe, bits, tools, cement, oil, etc.); (7) proportion of compressor repairs; (8) machine-shop work done directly on drill and equipment.

The table on page 263 will give a condensed statement in regard to progress, costs, and the like. It was kept by me for my immediate use, and has been of service in supplying quick information regarding such headings as it contains.

The Western Australian Mining Law is based on two fundamental principles: (1) that land shall be utilized for that purpose for which it is most valuable, and (2) that no man may hold mineral rights without development. Enforcement of the latter leads to the provision that none of the minerals to which the Government holds title shall be sold, but the Government may authorize the working of the mineral deposits by those conforming to the requirements of continuous development.

Water is commonly taken as weighing 62.5 lb. per cubic foot. The actual weight is 62.425 lb., at a barometric pressure of 30 in. and a temperature of 39.1° Centigrade.

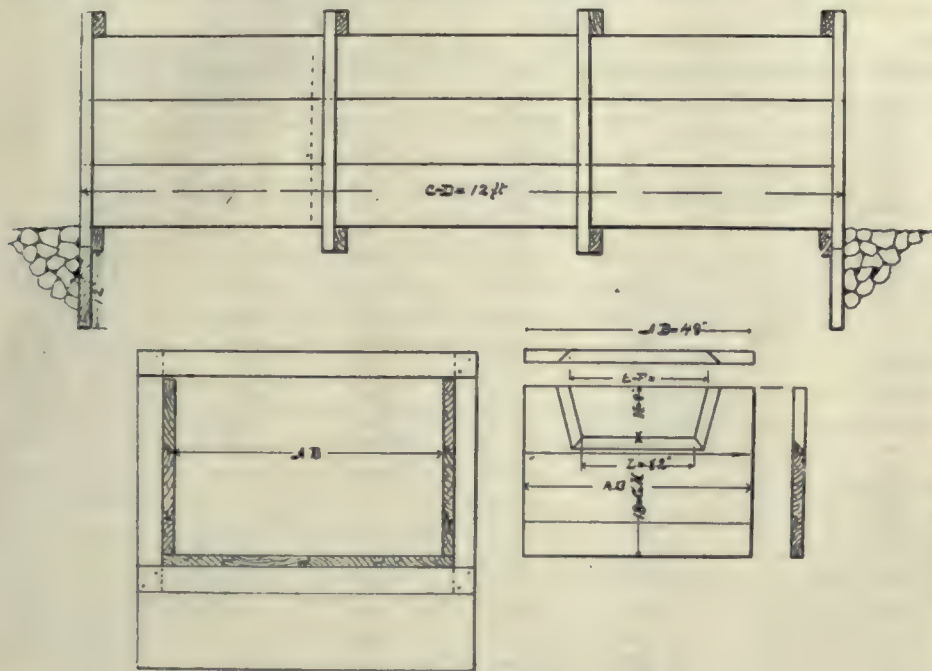


Drill Record Plotted.

WEIR MEASUREMENTS.

The term 'weir' is not always understood by those who use it. The term can properly be used only for structures designed to allow the water to flow over the crest with a considerable fall on the down-stream side. There are a large number of forms of weirs, taking their names from the shape

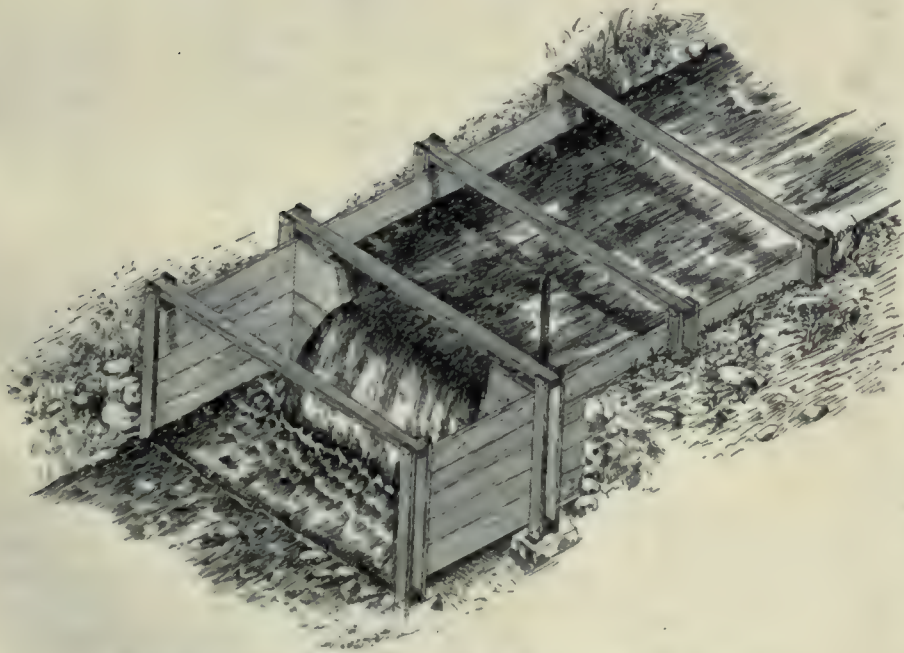
at an angle equal to 1 in. horizontally for every 4 vertically. Thus, for each additional inch in depth the weir notch widens on each side one-fourth of an inch, or a total addition of width of one-half inch. A weir having a length of crest of 1 ft., and designed to be 8 in. deep, will have a top width of notch of 16 in. The working drawings herewith show how such a weir can be constructed.



Working Drawings for Construction of Weir Box.

When the weir box is placed, care should be taken to have the bottom of the notch, or crest, level. An ordinary carpenter's spirit level may be used for this purpose. When the crest is horizontal, one end of the spirit level is placed on the centre of the crest, and when level the other end will mark the point for the zero of the weir gauge. In rough work a nail may be driven part way into the side of the box, the top of the nail being level with the crest of the weir. A thin plate of brass is to be preferred to a nail. In other cases gauges are inserted on the sides of the flumes and properly marked in tenths of feet or inches. At other times a post from 1 to 2 in. square is placed in the centre of the box and several feet above the weir board. The top of this post is on a level with the crest.

The method of measuring with this weir can best be shown by examples. Let us suppose that the engineer has made and placed a box similar to the one shown in the drawing. After turning in the water and allowing it some time to attain a uniform flow he proceeds to the weir box, and with an ordinary rule measures the depth of water flowing through the weir notch. Bear in mind that this measurement is not made at the weir board, but at the regu-



Weir Box in Operation Showing Rod for Measuring Depth of Stream.

lar gauge, whether it be a nail, brass plate, or post as already described. We will assume that the depth as found by the rule is 3 1/2 in. Now by referring to the table below, he follows down the first column until 3 1/2 is reached. The weir used is one foot, and under the column marked '1-foot weir' and opposite the figure 3 1/2 already found he finds the cubic feet per minute or the gallons per minute flowing over a 1-ft. weir when the depth of water is 3 1/2 in. The equivalent flow in gallons per minute

of the weir notch, or form of crest. The triangular weir has a V-shaped notch. The rectangular weir has a horizontal crest with vertical sides. Both of these forms of weir are good, when used by engineers who understand the principles and factors which enter into their calculations. In order to avoid the variables, Cipoletti invented the form of weir which has taken his name and which is in general use.

The Cipoletti weir has a thin horizontal crest, the sides of the weir notch sloping back from the vertical

for any given length of weir and depth of water over the crest was obtained from the following table:

Weir measurements have generally superseded the older methods of measuring 'miner's inches', though the latter term is still widely used. The quantity of water forming a miner's inch is defined in different States. In California and Montana it is 1.50 cu. ft. ately, has lowered the total for that centre. Queensland about holds its own, but Western Australia and New South Wales each report lower returns. The figures for the Commonwealth for the quarter are 51,267 oz. below those for the same term last year, and for New Zealand 14,548 oz. The returns for the Commonwealth and for Australasia for the past

| DISCHARGE OVER CIPOLETTI WEIRS. | | | | | | | | | |
|---------------------------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|--|
| Depth of water on crest. | | 1-ft. weir. | | 1½-ft weir. | | 2-ft. weir. | | 3-ft. weir. | |
| | Cubic feet | Gallons per | Cubic feet | Gallons per | Cubic feet | Gallons per | Cubic feet | Gallons per | |
| Inches. | per sec. | min. | per sec. | min. | per sec. | min. | per sec. | min. | |
| 1 | 0.08 | 36 | 0.12 | 55 | 0.16 | 73 | 0.24 | 109 | |
| 1¼ | 0.10 | 44 | 0.15 | 65 | 0.19 | 87 | 0.29 | 130 | |
| 1½ | 0.11 | 51 | 0.17 | 76 | 0.23 | 101 | 0.34 | 152 | |
| 1¾ | 0.13 | 59 | 0.20 | 88 | 0.26 | 117 | 0.39 | 175 | |
| 1½ | 0.15 | 67 | 0.22 | 100 | 0.30 | 139 | 0.45 | 200 | |
| 1¾ | 0.17 | 75 | 0.25 | 113 | 0.34 | 150 | 0.50 | 226 | |
| 1¾ | 0.19 | 84 | 0.28 | 126 | 0.38 | 168 | 0.56 | 252 | |
| 1¾ | 0.21 | 93 | 0.31 | 140 | 0.42 | 187 | 0.62 | 280 | |
| 2 | 0.23 | 103 | 0.34 | 154 | 0.46 | 206 | 0.68 | 308 | |
| 2¼ | 0.25 | 113 | 0.38 | 169 | 0.50 | 225 | 0.75 | 338 | |
| 2¼ | 0.27 | 123 | 0.41 | 184 | 0.55 | 245 | 0.82 | 368 | |
| 2¾ | 0.30 | 133 | 0.44 | 199 | 0.59 | 266 | 0.89 | 399 | |
| 2½ | 0.32 | 144 | 0.48 | 215 | 0.64 | 287 | 0.96 | 431 | |
| 2¾ | 0.34 | 154 | 0.52 | 231 | 0.69 | 309 | 1.03 | 464 | |
| 2¾ | 0.37 | 166 | 0.55 | 248 | 0.74 | 332 | 1.11 | 497 | |
| 2¾ | 0.39 | 177 | 0.59 | 262 | 0.80 | 355 | 1.18 | 531 | |
| 3 | 0.42 | 189 | 0.63 | 283 | 0.84 | 378 | 1.26 | 566 | |
| 3¼ | 0.45 | 201 | 0.67 | 301 | 0.90 | 402 | 1.34 | 602 | |
| 3¼ | 0.47 | 213 | 0.71 | 319 | 0.95 | 426 | 1.42 | 639 | |
| 3¾ | 0.50 | 225 | 0.75 | 338 | 1.00 | 451 | 1.51 | 676 | |
| 3½ | 0.52 | 238 | 0.80 | 357 | 1.06 | 476 | 1.59 | 714 | |
| 3¾ | 0.56 | 251 | 0.84 | 376 | 1.12 | 502 | 1.68 | 753 | |
| 3¾ | 0.59 | 264 | 0.88 | 396 | 1.18 | 528 | 1.76 | 792 | |
| 3¾ | 0.62 | 277 | 0.93 | 416 | 1.24 | 554 | 1.85 | 832 | |
| 4 | 0.65 | 291 | 0.97 | 436 | 1.30 | 582 | 1.94 | 872 | |
| 4¼ | 0.68 | 304 | 1.02 | 456 | 1.36 | 609 | 2.04 | 913 | |
| 4¼ | 0.71 | 319 | 1.07 | 478 | 1.42 | 637 | 2.13 | 956 | |
| 4¾ | 0.74 | 333 | 1.11 | 499 | 1.48 | 665 | 2.22 | 998 | |
| 4½ | 0.77 | 347 | 1.16 | 521 | 1.55 | 694 | 2.32 | 1,041 | |
| 4¾ | 0.81 | 362 | 1.20 | 543 | 1.61 | 723 | 2.42 | 1,084 | |
| 4¾ | 0.84 | 376 | 1.26 | 564 | 1.68 | 753 | 2.52 | 1,129 | |
| 4¾ | 0.87 | 391 | 1.31 | 587 | 1.74 | 782 | 2.62 | 1,174 | |
| 5 | 0.91 | 406 | 1.36 | 609 | 1.81 | 813 | 2.72 | 1,219 | |
| 5¼ | 0.94 | 422 | 1.41 | 633 | 1.88 | 843 | 2.82 | 1,266 | |
| 5¼ | 0.97 | 437 | 1.46 | 656 | 1.95 | 874 | 2.92 | 1,312 | |
| 5¾ | 1.01 | 453 | 1.51 | 679 | 2.02 | 906 | 3.03 | 1,359 | |
| 5½ | 1.05 | 469 | 1.57 | 703 | 2.09 | 938 | 3.13 | 1,407 | |
| 5¾ | 1.08 | 485 | 1.62 | 727 | 2.16 | 970 | 3.24 | 1,455 | |
| 5¾ | 1.12 | 501 | 1.68 | 752 | 2.23 | 1,002 | 3.35 | 1,503 | |
| 5¾ | 1.15 | 517 | 1.73 | 776 | 2.31 | 1,034 | 3.46 | 1,553 | |
| 6 | 1.20 | 534 | 1.79 | 801 | 2.38 | 1,069 | 3.57 | 1,603 | |
| 6¼ | ... | ... | ... | ... | 2.46 | 1,102 | 3.68 | 1,653 | |
| 6¼ | ... | ... | ... | ... | 2.53 | 1,136 | 3.80 | 1,704 | |
| 6¾ | ... | ... | ... | ... | 2.61 | 1,170 | 3.91 | 1,755 | |
| 6½ | ... | ... | ... | ... | 2.68 | 1,205 | 4.03 | 1,807 | |
| 6¾ | ... | ... | ... | ... | 2.76 | 1,240 | 4.14 | 1,859 | |
| 6¾ | ... | ... | ... | ... | 2.84 | 1,275 | 4.26 | 1,912 | |
| 6¾ | ... | ... | ... | ... | 2.92 | 1,310 | 4.38 | 1,966 | |
| 7 | ... | ... | ... | ... | 3.00 | 1,346 | 4.50 | 2,020 | |

per minute, which has been adopted by the Institute of Mining and Metallurgy. In British Columbia the official standard is 1.68 cubic feet. quarter compare with those for corresponding pe-riods in 1907 and 1908, as follows:

The Australasian gold yield for the first quarter of 1909, according to the *Queensland Government Mining Journal*, fails to disclose any revival in the indus-try. Viotoria does not show up badly, owing to the better returns obtained last month from several cen-tres, especially in the alluvial districts. The lower grade of ore being mined at Walhalla, unfortun-

| | 1907 | 1908. | 1909. |
|------------------------|----------|----------|----------|
| | Fine oz. | Fine oz. | Fine oz. |
| Victoria | 180,569 | 162,661 | 156,420 |
| New South Wales..... | 72,481 | 62,562 | 47,403 |
| Queensland | 109,458 | 93,145 | 92,722 |
| Western Australia | 425,156 | 410,639 | 382,395 |
| *South Australia | 4,687 | 3,600 | 2,400 |
| *Tasmania | 15,000 | 15,000 | 15,000 |
| Total Commonwealth | 807,351 | 747,607 | 696,340 |
| New Zealand | 111,381 | 124,251 | 109,703 |
| Total Australasia ... | 918,732 | 871,858 | 806,043 |

*Approximate.

U. S. GEOLOGICAL SURVEY FIELD WORK.

Field work of the United States Geological Survey in the Western States this season includes an examination of the phosphate lands of Idaho, Wyoming, and Utah by Hoyt S. Gale and Eliot Blackwelder, assisted by a chemist detailed from the Bureau of Soils. F. L. Ransome, assisted by E. S. Bastin, will study the Breckenridge, Colorado, mining district. Waldemar Lindgren and B. S. Butler will investigate the ore deposits at Frisco, Utah, where W. M. Beaman has been making a new, large-scale, topographic map. Mr. Lindgren, assisted by Howard Bancroft, will also report on the Republic mining district of Washington. F. C. Calkins will conduct surveys in northeastern Oregon, F. L. Hess at Randsburg, and Robert Anderson at Bakersfield, California. Whitman Cross will continue his work in the San Juan district of Colorado, working near Durango, and A. C. Spencer will study the mines and ore deposits at Ely, Nevada.

The coal land classification surveys will continue under charge of M. R. Campbell, who is making Denver his headquarters and visiting various field parties from time to time. L. J. Pepperberg is in charge of a party in the Mills River coal-field of Montana; C. T. Lupton and party will cover the Bull Mountain and Lower Powder River fields in Montana and Wyoming; W. R. Calvert will map the territory north of Livingston, Montana; C. H. Wegemann will survey the Powder River field, and E. G. Woodruff the Wind River Basin field; J. A. Davis will map the Yampa, A. L. Beekly the Glenwood Springs, W. T. Lee the Crested Butte, and J. H. Gardner the Durango field. G. B. Richardson will work in the southwestern New Mexico field. E. E. Smith, in co-operation with the newly organized State Survey, will work in Washington. J. S. Diller will study the Coos Bay coal-field of Oregon.

Topographic surveys in the National Forests are being especially pushed in view of their value not only in administration but in development of water and mineral resources. The assignments are as follows: Shoshone Forest, E. I. Ireland; Cache, Albert Pike; Caribou and Cache, A. E. Murlin; Holy Cross, E. R. Bartlett; Alamo, W. H. Manning; Gila, A. B. Searle; Lola, W. J. Forster; Couer d'Alene, W. O. Tufts; Bull Run, R. M. La Follette; Trinity, J. P. Harrison; Sierra, C. H. Birdseye; Washington, J. E. Blackburn. Crater Lake Park is being surveyed by Pearson Chapman; R. B. Marshall, Chief Geographer, is revising maps of Yosemite, Sequoia, and General Grant National Parks.

Co-operative surveys of the Sacramento valley are being made by W. H. Griffin, F. H. Moncure, and A. F. Fowler, and of the Willamette valley by Robert Muldrow. G. R. Davis, C. G. Anderson, and C. M. Weston will execute surveys in the vicinity of Hawthorne, Bridgeport, Mt. Goddard, McKittrick, Coalinga, Cantaur, and Salinas, California. In Washington, surveys of the Mt. Vernon, Morrison, and Quincy quadrangles will be made during the summer, and in the winter the Winkleman, Arizona, and Ivanpah, California-Nevada, quadrangles. At Medows, Idaho, A. O. Burkland, at Cutbank, Montana, R. W. Berry,

at Montrose, Colorado, Gilbert Young, and at Havre, Montana, W. L. Miller, are at work. C. L. Nelson is surveying and marking the Washington-Idaho boundary line. River profile surveys and special examinations are also being made at numerous points following with withdrawals of public land in connection with proposed legislation regarding water-powers.

PHILIPPINE PLACER MINING.

The operations of the Paracale Gold Dredging Co., Ltd., for the six months ended December 26, on the Paracale river, Camarines, Philippine Islands, show an average production of \$1 gold from every cubic yard of dirt dredged during that period, according to the *Far Eastern Review*. This is verified by the dredgemaster's daily report and corroborated by the statement of the International Banking Corporation. The former shows an actual dredging time of 2735 hours, with 50,244 cu. yd. of dirt handled, and the bank statement shows that 2814 oz. of bullion were sold at the smelter for \$50,653, or approximately \$18 gold per ounce. This is a trifle over \$1 gold per yard. The dredgemaster's report covers the period from May 23 to December 26, 1908, and the bank's statement covers the period from June 15, 1908, to January 1, 1909. The following is the summary of the dredgemaster's weekly reports covering the period referred to:

| 1908. | Actual | Bank meas- | | |
|--------------------------------|-----------|------------|----------|----------|
| Week | dredging | urements, | Yards | Repairs, |
| ending: | time, hr. | cu. yd. | per day. | hr. |
| May 30 | 102½ | 1400 | 433 | 41½ |
| June 6 | 115½ | 1733 | 288 | 28½ |
| June 13 | 125 | 1549 | 258 | 19 |
| June 20 | 116½ | 1743 | 290 | 27½ |
| June 27 | 117 | 1683 | 280 | 27 |
| July 4 | 118½ | 1743 | 289 | 25½ |
| July 11 | 102 | 1370 | 228 | 42 |
| July 18 | 123¾ | 2195 | 366 | 40¾ |
| July 25 | 125 | 2364 | 394 | 19 |
| Aug. 1 | 105¼ | 1970 | 328 | 38¾ |
| Aug. 8 Shut ..... | ..... | ..... | ... | 144 |
| Aug. 15 down ..... | ..... | ..... | ... | 144 |
| Aug. 22 for ..... | ..... | ..... | ... | 144 |
| Aug. 29 re- ..... | ..... | ..... | ... | 144 |
| Sept. 5 pairs ..... | ..... | ..... | ... | 144 |
| Sept. 12 | 62 | 1125 | 188 | 82 |
| Sept. 19 | 120½ | 1955 | 326 | 23½ |
| Sept. 26 | 128¼ | 3080 | 513 | 15¾ |
| Oct. 3 | 120¾ | 2464 | 411 | 23¼ |
| Oct. 10 | 75¾ | 1456 | 242 | 68¼ |
| Oct. 17 | 129½ | 3173 | 529 | 14½ |
| Oct. 24 | 112 | 3174 | 529 | 32 |
| Oct. 31 | 97½ | 2230 | 372 | 46½ |
| Nov. 7 | 112 | 2410 | 401 | 32 |
| Nov. 14 | 115 | 2120 | 353 | 29 |
| Nov. 21 | 118 | 2315 | 386 | 26 |
| Nov. 28 | 127 | 2426 | 404 | 17 |
| Dec. 5 | 131½ | 2365 | 391 | 12½ |
| Dec. 12 | 115 | 2210 | 368 | 29 |
| Dec. 19. Restack- ing ..... | ..... | ..... | ... | 144 |
| Dec. 26 tailing ..... | ..... | ..... | ... | 144 |
| Total | 2735¾ | 50,244 | ... | 1719¼ |

The company was established in 1907, with a capital stock of £10,000, and its shares are quoted at £1 10s. No dividends have yet been paid, but for some time its success has seemed assured.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

OIL AND GAS LEASE—FORFEITURE.

An oil lease provided that it should be void if a well was not completed, or in lieu thereof money paid, within a given time. And where the lessor by his conduct clearly indicated that payment would not be demanded when due, and thereby lulled the lessee into a feeling of security, and because of this he did not make payments when due, the lessor was not permitted suddenly, without demand or notice, to declare a forfeiture. In such case a forfeiture will be deemed waived by any agreement, declaration, or course of action on the part of the lessor, which was sufficient to lead the other party to believe that a forfeiture would not be incurred.

Pyle v. Henderson, (W. Va.) 63 Southeast. 762, Jan. '09.

PURCHASER OF MINING CLAIM—NO RESCISSION FOR FRAUD.

The purchaser of mining claims was not entitled to have the contract rescinded on the ground of false representations made by the vendor, where the deal was not closed until three months after the purchaser sent mining experts to examine the property, thereby giving the means of readily acquiring knowledge of the alleged falsity of the representations.

Mitchell Min. Co. v. Hammond, (Ariz.) 100 Pacific 695, March '09.

INJUNCTION TO PREVENT MINERAL DEPOSITS IN STREAMS.

The owner of arid agriculture lands, who has a right to use the water of a river for the purposes of irrigation, has such an interest in the water different from that of the general public, as entitled him to maintain an action to restrain a mining company from throwing its deposits of mineral refuse in streams tributary to such river which would render the water unfit for use.

Arizona Copper Co. v. Gillespie, (Ariz.) 100 Pacific 465, March '09.

QUIETING TITLE TO MINING CLAIMS.

The holder of an equitable title to land cannot sue to quiet title against one holding the legal title; accordingly where mining claims were sold to satisfy liens to a trustee for the lienholders, a purchaser of the interest of one of such lienholders, under an execution, could not sue to quiet title against a person claiming under a deed from the trustee.

Buchner v. Maloy, (Cal.) 100 Pacific 687, Feb. '09.

MINING CLAIM—QUIETING TITLE—COMPLAINT.

A complaint in an action to quiet title to a mining claim was held sufficient where it alleged, in substance, that the complainants were the absolute owners against every one except the Government, of a certain mining claim, by deed, from the original locator, and referring to the location notice as a part of the complaint, giving the book and page of its record in the recorder's office in the county.

Clason v. Matko, (Ariz.) 100 Pacific 773, March '09.

MINING CLAIM—PERFORMANCE OF ASSESSMENT WORK.

The payment of a large sum to persons employed in good faith to perform assessment work on a mining claim, was insufficient to prevent a forfeiture for non-performance of such work, where such person did no more than enter upon the ground and make a pretense of doing the work.

Protective Mining Co. v. Forest City Mining Co., (Wash.) 99 Pac. 1033, Feb. '09.

LOCATION OF MINING CLAIM—RECORDING NOTICES.

The United States statutes specifying the requirements of records of mining claims does not require the recording of location notices; this matter is left to local legislation or to regulation by the miners.

Sturdevant v. Vogel, 167 Federal 448, Feb. '09.

COMPANY REPORTS.

WAIHI GOLD MINING CO., LTD.

In the course of 15 years the dividend distributions by the Waihi Gold Mining Co., Ltd., have been on an ascending curve. The first dividend in 1893 was at the rate of 3s. per share, and amounted to the modest sum of £22,500. The growth has been notable; in 1908 the distribution was at the rate of 17s. per share, or £421,520. An income tax of £32,537 was paid also. The total dividends declared during the life of the mine have reached the grand total of £3,114,794. The bullion return for 1908 was £930,511, representing recovery from 393,214 tons, or \$11.47 per ton in terms of United States currency. Turning back to 1892, in the infancy of the company, we find an output of £46,219 from 20,492 tons, of \$10.65 per ton. Thus has the average been steadily maintained at approximately \$11 per ton, not only showing a remarkable deposit which could permit of such a record, but also a capable management that finds and adheres to a feasible average value of ore sent to mill. An examination of the mine output reveals the care taken to achieve this result. Stopping has been conducted at 40 different places on 9 different levels, in 12 mines of the group. In the Waihi mill 123,182 tons were treated, in the Victoria 264,667, and in the Union 28,982. The total extraction obtained during the year was 90.4% of the gold and 73.3 of the silver contents, representing a gain over the results achieved in 1907 of 1.4 on the gold-extraction, and 3% on the silver. All the concentrate from the three mills is treated in a special plant at the Victoria mill. A total of 6061 tons was handled, assaying:

| | Gold | | | Silver | | |
|------------------|-------|------|-----|--------|------|-----|
| | oz. | dwt. | gr. | oz. | dwt. | gr. |
| Heads | 5 | 10 | 19 | 65 | 19 | 0 |
| Tailing | 0 | 4 | 3 | 4 | 12 | 23 |
| Extraction, %... | 96.28 | | | 92.95 | | |

The milling is done with a total of 330 stamps, and 10 tube-mills. The average duty per stamp was 4167 tons per diem, representing an increase of 0.373 ton per stamp over the duty in 1907. As no details of the stamp-mill practice are given, nor any record of stamp-horag kept, closer analysis is impossible. The tube-mill plant, together with the vanners, and three elevator-wheels, are driven by three 200-Crossley gas engines. It has been found inadvisable to run more than three tube-mills with each engine. These engines are actuated by producer gas made on the premises. No trouble has been experienced with any part of this power plant, aside from the breakage of two engine crankshafts during the year. The costs of operating amounted to £381,392, or approximately \$4.74 per ton. Mining costs, including development, reached \$1.89 per ton. The development was 17,320 ft., of which 4286 was in cross-cuts through the country. Minute details of the separate items of expense are lacking, rendering close examination difficult. It may be well, however, to point out that the costs of crushing and milling were only 70c. per ton; metallurgical treatment (extraction) \$1.02; assaying and melting 10¼c; repairs and renewals, 10c.; salaries of local staff 9½c. The company affirms that it has reached the limit of commercial efficiency with the present plant, and that any increase in the percentage of extraction results in a loss. The pumping capacity at the mine has been increased by the provision of two 750-hp. gas producers, and two 368-hp. gas engines, and two electrically driven three-plunger pumps with a capacity of 1500 gal. per minute. The power plant will be erected at No. 5 shaft, and when the electric pumps are not in use the power will be applied in driving air-compressors and other machinery at No. 5 shaft. As soon as a demand is made on the pumping plant the power will be diverted to No. 7 shaft for the time being.

In June 1908, the Waihi Workmen's Union made demands in reference to a system of contracting, and a strike was averted only by the exercise of great tact. A more serious trouble arose in January. By the operation of a new Act certain heavy liabilities were imposed on mine-owners on account of pneumo-coniosis, or, as it is currently termed, 'miner's disease', being an affection of the lungs due to dust.

ELECTRIC-DRIVEN WELL-DRILLER.

Written for the MINING AND SCIENTIFIC PRESS
By J. VALE DOWNIE.

There has been some demand for a portable blast-hole drilling-machine operated by an electric motor instead of by a boiler and engine. Where blasting operations are conducted within the city limits, some inconvenience, and a large item of expense, are represented in providing a licensed engineer, as required by law, for each separate steam-driven machine. There is also economy in generating all power at a central plant. In some situations it is impossible to use the boiler. To avoid this some contractors have operated a series of machines from one centrally placed boiler, carrying steam-lines to the several machines. Some have used compressed air in the same way, as was done in the extensive blasting operations on the low grade cut-off of the Pennsylvania railroad. But this involves the constant re-laying of steam or air-lines, with bother and loss of power from condensation, leakage, and the like. The motor-driven drill was designed to obviate these and other disadvantages connected with the steam machine as used on certain classes of work.

The Keystone electric-driven machine recently tried at the James & A. C. O'Laughlin quarry, at Belwood, near



Keystone Electric Well Driller Showing Motor Box.

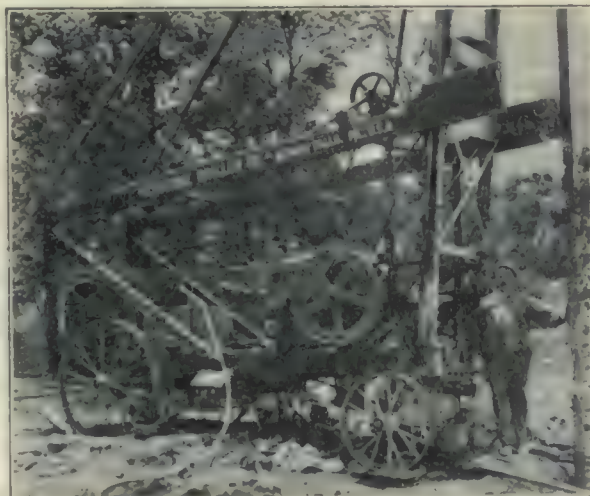
Chicago, was equipped with a 10-hp. specially geared motor, placed over the rear truck of the machine, and belted to the drilling mechanism. (See Illustration). The drilling-mechanism is back-geared, and balanced so as to run light and smoothly. The controller-box is placed at the drill-operator's hand, in front, as shown in the illustration, along with the other levers which regulate and control the various operations of drilling. The manipulation of the motor is simple, and the ordinary drill-man will become thoroughly competent to handle it with a few minutes' instruction from the electrician. The laying of feed-wires and other like adjustments will be looked after by the electrician in charge. One man can easily handle the machine without assistance, except when sand-pumping or moving the rig to a new hole. This is another saving on the cost of operating the steam-machine, which requires the constant attention of a fireman, besides the driller. The motor, drilling-mechanism, derrick, etc., are all unified in a machine which is moved from hole to hole in its entirety. For short moves the derrick is not taken down.

At full speed of the motor the drilling tools drop about 60 strokes per minute, which is ample in all cases to obtain the maximum drilling speed. As the hole becomes deeper or clogged with cuttings, before sand-pumping, the rapidity of the stroke is gradually reduced to say 50 strokes per minute, in order that the cutting bit may deliver its blow with best effect. This can be done by reducing the speed of the motor. The drilling tools used

with this outfit comprise a stem, weighing about 1000 lb., drill bit of 150 lb., and rope-socket of about 50 or about 1200 lb. in all. The bit cuts a 5½-in. hole and the stem is 3¾ in. diam., and 22 ft. long. The stroke being from 30 to 36 in., a blow equal to about 3000 to 3500 foot-pounds can be obtained at each stroke. This is sufficient to cut a 5½-in. hole very rapidly through any formation.

Best results have been obtained, in blast-hole drilling, with the 5½-in. hole. This size obviates the necessity of 'squibbing' charges which must be employed in the smaller holes. It is also more easily and cheaply drilled than a hole of larger or smaller diameter. The larger hole involves more cutting while permitting no corresponding advantage in size and weight of drill-bar; the heaviest practicable tools can be operated in the 5½-in. hole. On the other hand a smaller hole necessitates a reduction in the diameter and weight of the stem and bit, which detracts from their efficiency. It has been proved experimentally that a 6-in. hole can be drilled more quickly and cheaply than a 3-in. hole.

The results of the test at the O'Laughlin quarry were as follows: The machine was set up Saturday evening, June 5, 1909, at 5 o'clock, and began drilling. It was operated for one hour, during which 9 ft. were drilled in fairly hard limestone. From this time until the following Friday forenoon four 66-ft. holes, 5½-in. diam. were drilled, the



Keystone Drill Showing Controller Box at Driller's Hand.

work being done without a hitch, and without the necessity of any change whatever in the machine. In the following week were drilled four holes 105 ft. in depth, the machine running 10 hours per day in all cases. The record of a similar machine at Racine, Wis., in slightly harder rock was 900 ft. in 200 hours, including all stops and delays in moving the machine.

This is a remarkably successful test, and a very satisfactory demonstration of the practicability of electric-driven well-drills. The machine was more or less of an experiment, nothing of the kind having been tried before.

The Keystone Driller Co. had guaranteed the machine to drill to a depth of 60 ft. at the rate of 40 ft. per day of 10 hours, or 4 ft. per hour. The purchasers of the outfit now state that it is drilling 5 ft. per hour, including all stops, which must be regarded as a very good showing in hard rock. This is probably equal to the results obtained with the best steam-machine, under the most favorable circumstances. The advantages of the steam-machine in variability of speed and reversibility of engine seem to be not very great. This machine is built with gear-hoist, capacity 500 ft., or with friction-hoist, capacity 350 ft. The latter style is probably the better for quarry and cut-drilling, where the tools are being constantly raised and lowered, as in tamping a charge. One driller reports that he raised and lowered his tools 900 times in one day, when tamping dynamite charges in four holes. The holes will rarely run over 150 ft. in depth. The machine is also made with traction attachment, for self propulsion, and,

while it is impracticable to move it over great distances, on account of carrying along the electric feed wires, for short moves from hole to hole, or from one side of the quarry to the other, it is a great advantage. The delay in waiting for a team of horses is saved, as well as the expense. For short moves the self-braced derrick is left standing.

The advantage of large deep blast-holes in saving 'squibbing' charges has been referred to. Another advantage is that the holes can be sunk from the surface to a point a little below the base of the breast, no matter how high the face of the quarry. A heavy charge is then placed at the bottom and the whole breast is lifted out at one discharge, without the necessity of stoping and cleaning up at various levels. From the simultaneous discharge of 4 holes, 5½-in. diam., and 66 ft. deep, the manager of the quarry states that 20,000 cu. yd. of stone were thrown down by one shot. The explosive consisted of dynamite to the amount of 5500 lb. packed solidly in the holes to within 25 ft. of the top, and tamped with screenings. The blast is made much more effective by drilling the holes properly. The large holes allow the powder to be well bunched at the bottom. Generally the machine is used for loading the holes. For this service the regular drilling-bit is removed, and in its place a wooden rammer is placed on the drill-stem. Five to eight sticks of dynamite having been dropped into the hole, the drilling tool is lowered after them, forcing them into a compact mass at the bottom. The tools are then withdrawn, and the process is repeated until the hole is filled to within 25 ft. of the surface. At this point the exploding caps and wires are inserted, and the holes are packed full of sand and gravel to the top, by hand.

Some conception of the quantity of material thrown out by such a blast may be gathered from the effect of one shot in the O'Laughlin quarry. From the base of the breast to the edge of the débris was a distance of about 200 ft. The breast was 105 ft. high. For this shot the holes were put down only half way, though the engineer in charge states that they might as well have been sunk to the bottom, and in the future this will be done. In this case there were a few large chunks in the débris which will have to be drilled and blasted; but nearly all was in condition to be handled by the steam-shovel and taken at once to the crusher.

THE total production of coal in West Virginia in 1908, as reported to E. W. Parker, of the U. S. Geological Survey, was 41,897,843 short tons, having a spot value of \$40,009,054. Owing to conditions more favorable for the cheap production of coal in West Virginia, her percentage of decrease during 1908 was less than in Pennsylvania, Maryland, Alabama, and Ohio. The decrease was 6,193,740 short tons, or 12.88%, from the output in 1907. The decrease in Pennsylvania (bituminous coal) was 21.95%, in Maryland 20.89, in Alabama 18.57, and in Ohio 18.27. The decrease in value of the production in 1908 was \$7,837,576, or 16.38 per cent.

ALABAMA'S coal production in 1908, as reported to E. W. Parker, of the U. S. Geological Survey, was 11,604,593 short tons, having a spot value of \$14,647,891. The effect of the business depression was exhibited by a decrease of 2,645,861 short tons, or 18.57, in quantity, and of \$3,757,577, or 20.42%, in value, as compared with the output of 1907. Nearly half of the decline in production was in the quantity of coal made into coke, this item having decreased from 4,973,296 short tons in 1907 to 3,857,791 short tons in 1908.

CHROMITE of chromic iron ore production is an industry of minor importance in the United States, owing to the small extent of the deposits. According to a report by E. C. Harder, just issued by the U. S. Geological Survey, the maximum output was reached in 1894, when the production was 3680 long tons. In 1908 but 359 tons, worth \$7230, was produced, mostly in California. The imports of chromic ore in the same year were 27,876 tons, mainly from New Caledonia, Greece, and Canada.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

ANNUAL REPORT OF THE MINISTER OF MINES FOR 1908, IN BRITISH COLUMBIA. Pp. 269. Ill. Victoria, 1909.

This is a well prepared, well printed, well bound summary of current mining operations in the Province. It contains excellent statistical data, the reports of the various gold commissioners, summary statements regarding mining operations, lists of certificates of competency issued by the Bureau of Mines, and miscellaneous reports by the Provincial Mineralogist and by members of the Geological Survey of Canada. British Columbia has a total recorded mineral production of \$323,377,559, of which \$23,851,277 was produced in 1908. The largest single item in the total production is gold, which has amounted to \$70,196,103 from the placers and \$50,353,597 from the lodes.

FLUOSPAR DEPOSITS OF KENTUCKY. By F. J. Fohs. Kentucky Geological Survey, Bull. 9, Pp. 296. Ill. Index. Lexington, Ky., 1909.

This report is of the excellent type where the author not only gives the details regarding the local deposits, but summarizes existing information relating to the material elsewhere. The occurrence, production, technology, and market conditions are all discussed. In view of the tariff just put on fluorspar the report is especially timely. There is opportunity for considerable expansion of the fluorspar industry in America, and Mr. Fohs' report is the only complete work available. It will undoubtedly prove widely useful.

INDEX OF MINING ENGINEERING LITERATURE. By Walter R. Crane. 8vo. Pp. XII. 812, Index. John Wiley & Sons, New York, 1909. Price, cloth, \$4; morocco, \$5.

This book has been prepared as a result of the author's own needs through a series of years, and is intended to cover mining, metallurgical, civil, mechanical, electrical, and chemical engineering subjects as related to mining. The material has been roughly classified under various subjects, from accidents, to water, and under each heading there is a secondary classification, but beyond that there seems to be no special order. The book will serve a useful purpose.

IRON ORES OF NOVA SCOTIA. By J. E. Woodman. Dept. Mines, Mines Branch, pp. 226, Ill., Maps. Ottawa, 1909.

This is the first part of a report based on surveys begun in 1906. It covers the geographic relations of the deposits, the geology, an account of titles and bounties in the Province, a brief description of costs and labor conditions, and detailed descriptions of the deposits in eight of the districts.

REPORT OF THE NATIONAL CONSERVATION COMMISSION. Pp. 52. Bull. 4.

Issued by the Joint Committee on Conservation, Washington, 1909. Containing the report of the Commission and a history of the conservation movement.

MINING AND QUARRY INDUSTRY OF NEW YORK STATE. By D. H. Newland, New York State Museum, Bull. 132. Pp. 99. Albany, July 15, 1909.

Detailed report on the operations and production during 1908.

ARTIST OR ARTISAN—WHICH? By Victor C. Alderson. Quarterly. Colorado School of Mines. Vol. 4, No. 1, July 1909.

Commencement address, South Dakota School of Mines.

PETROLEUM AND COALS, COMPARED IN THEIR NATURE, MODE OF OCCURRENCE AND ORIGIN. By Eugene Coste. Canadian Mining Institute, Vol. 12, pp. 29. Ottawa, 1909.

YEAR BOOK OF THE MICHIGAN COLLEGE OF MINES, 1908-1909.

Commercial Paragraphs.

THE WOOD DRILL WORKS of Paterson, New Jersey, are distributing their monthly circular, No. 47, giving a review of work on the Tieton Project, U. S. Reclamation Service. It can be procured from any of the American sales offices.

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TABLE OF CONTENTS.

| | |
|--|------------------------|
| EDITORIAL: | Page. |
| Notes | 271 |
| Phases of the Mexican Situation..... | 271 |
| Classification of Public Lands..... | 272 |
| Gases from Explosives and Mine Economy..... | 272 |
| Metal Markets and a Merchant Marine..... | 273 |
| GENERAL MINING NEWS | 275 |
| SPECIAL CORRESPONDENCE | 280 |
| CONCENTRATES | 286 |
| DISCUSSION: | |
| A Russian Money Trust.....Jerome B. Landfield | 287 |
| Churn-Drill Gravel-Sampling.....J. P. Keene | 288 |
| Slime.....Harrison Everett Ashley | 289 |
| Asbestine | E. Schaaf-Regelman 289 |
| ARTICLES: | |
| Geology of Northern Mexico.....R. H. Burrows | 290 |
| Boston-Sunshine Mill.....G. W. Wood | 295 |
| Hand-Churn Drilling.....O. H. Packer | 296 |
| Gases Resulting from High Explosives.Wm. Cullen | 297 |
| Mineral Deposits in Trebizond..... | 299 |
| Copper in Jamaica | 299 |
| Gas Engines for Mining Purposes...A. S. Atkinson | 300 |
| Exhaust Steam Low-Pressure Turbines..... | 304 |
| MINING AND METALLURGICAL PATENTS..... | 303 |
| DECISIONS RELATING TO MINING..... | 304 |
| DEPARTMENTS: | |
| Personal | 274 |
| Market Reports | 274 |
| Publications Received | 302 |
| Commercial Paragraphs | 304 |
| Catalogues Received | 304 |

EDITORIAL.

AS a first answer to protests against the restriction of code-words to five letters, the telegraph companies have suspended the application of the new order until December 1. If the initial growl with which the order was received be continued the 'suspension' will become permanent.

THE WAIHI Gold Mining Co., Ltd., now has liquid assets of over two million dollars. Each year approximately 10 per cent is written off for depreciation, so that now the book value of the property, which cost \$5,000,000, is \$1,800,000, while the market value is \$22,000,000. The conservative management of this great property affords many a lesson.

Phases of the Mexican Situation.

Americans in Mexico are organizing committees to protest against the exaggerations of the daily press in this country which find capital for sensationalism in the political ferment over the approaching elections. These protests cannot fail to make an impression upon thoughtful people on this side of the Rio Grande. Impressive also are the activities of the Pearsons and the Southern Pacific in railroad building, and the conclusion of such transactions as that which resulted in the purchase of the La Blanca mine at Pachuca the other day by capitalists led by Mr. John Hays Hammond. It is doubtful whether foreign capital has ever been poured into Mexico so abundantly at any period in her history as during the past six months. The political agitation has been at bottom a protest against the liberality of the Government in granting concessions and in favoring foreign corporations in ways which have given them an advantage over domestic companies. This has furnished a motive for raising the popular cry of 'Mexico for the Mexicans', and such a sentiment naturally opens an opportunity for demagogues. Government cannot turn a deaf ear to such appeals, in Mexico or in any other country. To do so is to invite political embarrassment. It is not surprising, therefore, to note that Señor José Yves Limantour, the Secretary of Finance, has requested a more rapid advancement of Mexicans in the railway service, and that Señor Olegario Molina, who holds the portfolio of Fomento, has placed limitations through the mining regulations upon new business undertaken by foreign corporations. The revised mining law has not yet become operative, and it is hinted that some restriction, similar to that now put into force, will be incorporated in the final Act. This, however, will not affect corporations protocolized under the old law, and will not preclude absolute control of new operations through the ownership of Mexican

corporations by aliens or by foreign companies. It is only a sop to the multitude to appease a popular demand in the interest of political calm.

Classification of Public Lands.

The address delivered before the Irrigation Congress by Mr. George Otis Smith, Director of the United States Geological Survey, and published in the MINING AND SCIENTIFIC PRESS, August 14, will warrant a careful reading. There are wide-spread misconceptions regarding the means by which the public lands are classified. At the Trans-Mississippi Commercial Congress at Denver last week an entire session was devoted to debate upon a resolution proposing that a commission be established to make "topographic and economic" surveys of the National Forests, and to recommend to President Taft for elimination all lands more valuable for mineral or agricultural than for forestry purposes. The chairman of the sub-committee on resolutions, Mr. Charles F. Potter, stated that no authority now existed in law for making such surveys, and the mover of the resolution, Mr. T. M. Patterson, hailed the proposal as something new and as affording the only satisfactory solution of many vexed problems. As a matter of fact, both gentlemen were evidently ignorant of the present provision of the United States statutes, and also of work which has been going on for a number of years. One of the duties given to the United States Geological Survey when it was established in 1879 was the "classification of the public lands," and since the first field-season "topographic and economic" surveys of the public lands have been made. For a number of years there has been a specific appropriation for topographic surveys in the Forest Reserve, and large portions of the Forests have been so surveyed. On the field-sheets of these surveys the character of the land, whether agricultural, wooded, mineral, arid, or watered, is indicated. These reports are supplied to the Land Office and to the Forest Service, and selection of lands for withdrawal from entry or for elimination from the Forests, is based on these maps wherever available. That only parts of the Forests have been surveyed is due to the rapidity with which the reserves have been created, and the limited appropriations made for work. Two years ago the appropriation was reduced, neither Mr. Patterson nor Mr. Teller, at that time in the U. S. Senate, who are now so active in demanding that the surveys be made, entering any protest.

There is no question that in the National Forests as now delimited, lands have been included which might well be withdrawn. The boundaries were determined as accurately as existing maps permitted, and the President has now authority to exclude from the Forests any lands found to have been wrongly included. Such lands are now being constantly thrown open to entry. On the other hand, no additional lands can be included in the Forests except by Congressional action. In view of these facts, it is not clear what good purpose would be served by creating a new commission to undertake work already being done by warrant of law by a well-organized and

capable bureau. The need is rather for strengthening existing agencies. No good can come from a hurried and imperfect survey. If the public lands are in each case to be put to their highest use they must be studied and classified by competent men acting on the basis of adequate data. More and more it is becoming apparent that much of the present friction between the Government and individuals over the entry of lands is due to imperfect classification.

Gasses from Explosives, and Mine Economy.

Few details of mine management offer larger opportunities for improvement than the use of explosives. Pride in betterment of technical operations has stimulated workmen in almost every branch of mining, with this exception. Attention to the subject of blasting has been forced upon coal miners, on account of the peculiar perils presented by an atmosphere liable at any time to contain explosive mixtures of gas and air, but the metal miner has been suffered to pursue unrestricted whims. The result is an economic waste attaining great aggregate magnitude. Not only is powder applied inefficiently, but the imperfect combustion of the explosive results in vitiating the atmosphere in the mine with carbon monoxide, an active poison. Thus the health and efficiency of the workmen are impaired. The demands of miners for better ventilation are becoming more insistent, but there is manifest folly in deliberately fouling the air and then providing means for overcoming the damage done. It reminds one of taking a poison in sheer wantonness only to follow it with an antidote. In the Rand gold mines of South Africa the question of gases from high explosives is receiving critical attention. Elsewhere in this issue we publish results of researches made by Mr. William Cullen to determine the quantities of carbon monoxide produced in the detonation of gelatine dynamite under various conditions, which lead him to declare that large volumes are always evolved in ordinary practice, the actual amount present in the air near the end of a closed drift after blasting being approximately one per cent, and the ratio between the CO and CO₂ being about one to eight. In view of the fact that theoretically under ideal conditions the combustion should be so perfect as to yield no carbon monoxide at all, and as the ratio between the calorific intensity of combustion yielding CO and CO₂ is as 1 to 3.26, it is seen how great is the waste of explosive when imperfect detonation occurs.

The work of Mr. Cullen does not seem to us conclusive, although it is immensely suggestive. There are many factors entering into the efficient detonation of dynamite and blasting gelatine which he fails to take into account in his experiments. The use of tamping is undoubtedly beneficial, and clay is better than sand or loose earth. Nevertheless, the importance of tamping decreases with the violence and suddenness of the detonation; in other words, the greater the velocity of the detonating wave, the more perfectly is the inertia of the air realized as a sufficient resistance to prevent relief of pressure through the drill-hole. As a matter of fact, however, the

suddenness of the detonation is never sufficient in ordinary practice to enable the operator to dispense with tamping. Homogeneity of the charge is a still more important consideration. We are inclined to attribute imperfect detonation more to lack of this than to any other cause. The higher the velocity of the detonating wave the more perfect will the combustion be; any alteration in the velocity of transmission of this wave through the charge results in inequalities of combustion which means an increase in the percentage of carbon monoxide, with a corresponding diminution in the expansive effort of the resultant gases. Our Johannesburg correspondent this week refers to a new mixture, with gelatine dynamite as a base, lately presented by Mr. Cullen, intended to prevent the formation of obnoxious fume. It is unfair to offer criticism upon this suggestion, but unless an explosive be properly used nothing can alter the fact that efficiency is lowered thereby, and carelessness in charging holes would seem to be encouraged in proportion as men are relieved from injurious consequences of neglect. In common 50 per cent dynamite as manufactured in this country today, an excess of over 6½ per cent of available oxygen is provided in the mixtures. That is certainly ample to insure complete combustion under intelligent use, but when miners place a primer in the middle or at the bottom of a charge, when the powder is not carefully pressed in, when weak detonators are employed, and when these are inserted without regard to perfect contact with the explosive, an excess of oxygen will not prevent imperfect combustion of the powder. It is impossible to secure more than an approximation to ideal conditions, but certain patent errors in manipulation can be avoided, and the efficiency of the explosive increased. It would be interesting to obtain data concerning the amount of explosive consumed in mining under various conditions, but these facts seldom appear in company reports. In some mines the amount used in stoping is as low as a half pound per ton of ore; in others it amounts to several pounds. There are probably few mines in which it might not be greatly reduced, and every quarter pound per ton, at an average price of 12 cents, at a mine producing 1000 tons per day, would involve a saving of over \$10,000 per annum, accompanied with improvement in the health of the men employed underground.

Metal Markets and a Merchant Marine.

A popular impression exists that the new tariff law re-establishes a discriminating duty between goods imported in foreign and American vessels. This, however, is neither new nor will it be effective. It was by a differential duty of 10 per cent, favoring imports in American ships, that the maritime commerce of the United States invaded all corners of the globe in the early days of the Republic. Concessions were then made, under pressure from other countries, by treaty and by statute, destroying this eminently protective advantage. Those disabilities still exist, and the present law, after making its empty affirmation, adds that this "shall not apply to goods, wares, and merchandise which shall be imported in vessels not of the United States, entitled at

the time of such importation by treaty or convention or Act of Congress to be entered, etc., etc." This was also stated in the Dingley bill in similar terms. Congress is powerless to write an effective law of this tenor into the statutes. That is the humiliating fact; and an administration that would pretend to pave the way for such a regulation by diplomacy would need a bigger navy than we now possess in order to give convincing force to its remarks, else it would stultify itself as President Polk did playing Bombastes Furioso with his futile 'Fifty-four Forty or Fight'. Mr. A. H. Barchfeld, representative from Pennsylvania, at an after-dinner speech in San Francisco, Monday night, informed his fellow banqueters that President Taft and the potentate of the House of Representatives authorized him to say that the sixty-first Congress will enact a ship subsidy bill that will create a great merchant marine, giving us commercial control of the seas. We suppose Speaker Cannon actually can achieve it if he wishes; and Mr. Taft could help. Then there would be no need for writing an apology after the signature. Whenever the steel trust is willing we can have a merchant marine. Mr. Cannon knows Judge Gary's mind on that point. Let us hope Mr. Barchfeld knew what he was saying, even if we do have to pay the steel magnates 'both going and coming', as the phrase is.

The control of ocean-borne commerce means control of the metal market of the world, which will give smelter's profit as well as banker's toll. In the aggregate this involves one of the largest commissions to be taken from the conduct of international trade, and it would bring to this country a profit which would overtop the cost as the Sierras tower above the foothills. The mining industry has a legitimate interest in the development of a merchant marine. It will enlarge the volume of the smelting business in America, will provoke keener competition, and will provide cheaper rates for treatment, to say nothing of the expanded market abroad for metals and metallic manufactures. An accessible world-market is as much better for controlling and steadying demand and price, as the Great Lakes are more efficient in regulating floods than is the Tensas basin for a fluctuating Mississippi. To merely spill over into foreign trade when times are flush does not give that stability which comes from the vital relations which are brought into being through a great merchant marine and the foreign commerce it creates. With such a stimulus the mines of America would not suspend as they did a year and a half ago.

If we may not apply the principle of discriminative duties perhaps we can pay a bounty on importations in American bottoms. Each country has its own peculiar boggy; Canada shrinks from increasing the tariff on iron and lead, but pays bounties without a shudder; the Americans adjust themselves to the burden of high customs duties as a pack-mule to his load, but take fright at an open payment of cash for the encouragement of industry. "What's in a name?" What matter whether we call the same thing bounty or protection, so long as it gives us strength?

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

J. H. CURLE is in Norway.

P. GEORGE GOW is in Scotland.

HENRY KRUMB is at Ray, Arizona.

H. F. COLLETT is in San Francisco.

LEON DOMINIAN has gone to New York.

ANDRÉ P. GRIFFITHS was in Paris lately.

WALDEMAR LINDGREN is in San Francisco.

W. P. GRIGSBY has gone to Goldfield, Nevada.

T. S. MATHIS has gone to Hanover, New Mexico.

F. E. ROCKWELL has gone to Floyd Hill, Colorado.

JUSTIN H. HAYNES has gone to Telluride, Colorado.

ALWYN C. SMITH has returned to Golden, Colorado.

W. J. BARNETT has returned to London from Siberia.

C. H. GRIFFEN, Jr., has returned to Berkeley, California.

ALGERNON DEL MAR has gone to Sutter Creek, California.

A. E. DRUCKER has been in Kalgoorlie, Western Australia.

E. C. LIMBACH has removed from Seattle to Loomis, Washington.

THEODORE J. HOOVER has returned to London from the Caucasus.

L. K. FLETCHER has left Salt Lake City and is now in San Francisco.

THOMAS NUTTALL MILLER has returned to Douglas City, California.

RALPH C. NOWLAND is spending a few weeks at Spokane, Washington.

W. A. KUNKLE has left Indé, Durango, and is now at Aspen, Colorado.

W. H. GARLICK has gone to Easton, Maryland, from Ontonagon, Michigan.

F. F. KETT has left Berkeley to go to the Braden Copper Co. at Graneros, Chile.

N. H. EMMONS has become general manager for the Tennessee Copper Company.

A. SONSTHAGEN has gone from Terrazas, Chihuahua, to Orogrande, New Mexico.

W. B. MCPHERSON has returned from Las Baños, California, to San Francisco.

J. V. BOHN is general superintendent of mines for the Tennessee Copper Company.

JOHN H. EGGERS has gone to San Sabastian, Jalisco, Mexico, from San Francisco.

FOSTER HEWETT has been in South Pass, Wyoming, Wallace, Idaho, and Butte, Montana.

FREDERICK H. MORLEY has gone to Chihuahua. He will return to Denver about September 15.

STANLEY N. GRAHAM has returned to Kingston, Ontario, from Hostotipaquillo, Jalisco, Mexico.

T. M. LOWRY, Government Inspector of Mines in West Africa, is in England on leave of absence.

W. BROADBRIDGE has arrived in London from West Africa, but he is returning thither immediately.

BENJAMIN LE ROY MILLER and J. T. SINGEWALD, Jr., of South Bethlehem, Pennsylvania, were in San Francisco.

G. E. KEDZIE has left the Ventanas mine at Chavarria, Durango, and is at present in the city of Durango, Mexico.

E. H. WEBSTER has left the Fianza Mining Co., Guanaceví, Durango, to become resident manager of the República mine, Ocampo, Chihuahua.

THOMAS COX has sailed from Perú for New York. He will reside in San Francisco. The firm of Cox & Juessen will specialize in the design of mining, milling, and smelting plant.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, August 28.

| | | | |
|--------------------------|------------|--------------------------|-------------|
| Antimony | 12-12½c | Quicksilver (flask)..... | 43.50-44.50 |
| Electrolytic Copper..... | 15½-16½c | Spelter | 8½-7½c |
| Pig Lead..... | 4.65-5.60c | Tin | 32-33½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|----------------------|-------|----------|-----------------|
| Aug. 20..... | 13.00 | 4.40 | 5.81 | 51 |
| " 21..... | 13.00 | 4.40 | 5.81 | 51 |
| " 22..... | Sunday. No market. | | | |
| " 23..... | 13.00 | 4.40 | 5.81 | 51 |
| " 24..... | 13.00 | 4.40 | 5.80 | 51½ |
| " 25..... | 13.00 | 4.40 | 5.80 | 51½ |
| " 26..... | 13.00 | 4.40 | 5.80 | 51½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Aug. 19. | Aug. 26. |
|------------------------|----------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 5 9 | 1 5 6 |
| El Oro..... | 1 5 9 | 1 5 6 |
| Esperanza..... | 2 18 9 | 2 19 4½ |
| Dolores..... | 1 10 0 | 1 10 0 |
| Oroville Dredging..... | 0 12 3 | 0 12 6 |
| Mexico Mines..... | 6 10 0 | 6 5 6 |
| Tomboy..... | 1 1 3 | 1 1 3 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

| | Closing Prices. | |
|--------------------------------------|-----------------|----------|
| | Aug. 19. | Aug. 26. |
| Amalgamated Copper..... | 84½ | 82½ |
| American Smelting & Refining Co..... | 99½ | 99 |
| Boston Copper..... | 15½ | 15½ |
| Butte Coalition..... | 25½ | 25 |
| Cumberland-Ely..... | 7½ | 7½ |
| Dolores..... | 6 | 6 |
| El Rayo..... | 2½ | 2½ |
| Giroux..... | 10 | 9½ |
| Greene-Cananea..... | 9½ | 9½ |
| Indiana Sonora..... | 5 | 2½ |
| La Rose..... | 8½ | 8 |
| Miami Copper..... | 16 | 16½ |
| Nevada Consolidated..... | 23½ | 24½ |
| Newhouse..... | 3½ | 3½ |
| Nipissing..... | 10½ | 10½ |
| Ohio Copper..... | 4½ | 4½ |
| Tennessee Copper..... | 38½ | 37 |
| Utah Copper..... | 50½ | 50½ |
| Yukon..... | 4½ | 5½ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

| | Closing Prices. | | Closing Prices. |
|--------------------------|-----------------|---------------------------|-----------------|
| | August 26. | | August 26. |
| Adventure..... | 6½ | Mohawk..... | 61 |
| Allouez..... | 46½ | North Butte..... | 59½ |
| Atlantic..... | 10½ | Old Dominion..... | 56 |
| Calumet & Arizona..... | 105 | Osceola..... | 144 |
| Calumet & Hecla..... | 685 | Parrot..... | 32 |
| Centennial..... | 96 | Santa Fe..... | 2½ |
| Copper Range..... | 81½ | Shannon..... | 15½ |
| Daly-West..... | 8 | Superior & Pittsburg..... | 16 |
| Franklin..... | 16 | Tamarack..... | 70 |
| Granby..... | 100 | Trinity..... | 12½ |
| Greene-Cananea, ctf..... | 9½ | Utah Con..... | 44½ |
| Isle Royale..... | 26½ | Victoria..... | 4 |
| La Salle..... | 14½ | Winona..... | 6 |
| Mass..... | 7 | Wolverine..... | 155 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, August 26.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 16 | Mayflower..... | \$ 14 |
| Belmont..... | 90 | Midway..... | 22 |
| Booth..... | 16 | Montana Tonopah..... | 95 |
| Columbia Mtn..... | 10 | Nevada Hills..... | 80 |
| Combination Fraction..... | 74 | Ophir (Comstock)..... | 1.27½ |
| Daley..... | 23 | Pittsburg Silver Peak..... | 54 |
| Fairview Eagle..... | 15 | Rawhide Coalition..... | 24 |
| Florence..... | 3.05 | Rawhide Queen..... | 25 |
| Goldfield Con..... | 6.85 | Round Mountain..... | 69 |
| Gold Kewenas..... | 11 | Sandstorm..... | 10 |
| Great Bend..... | 8 | Silver Pick..... | 16 |
| Jim Butler..... | 14 | St. Ives..... | 10 |
| Jumbo Extension..... | 20 | Tonopah Extension..... | 100 |
| Llanos Con..... | — | Tonopah of Nevada..... | 7.00 |
| MacNamara..... | 32 | West End..... | 32 |

General Mining News.

ARIZONA.

COCHISE COUNTY.

The Denn-Arizona Copper Co. has started sinking from the 1250-ft. level. The ore here is mixed sulphide, oxide, and some native copper, and it is hoped to reach the sulphide zone at the 1500-ft. level.—The adit on the Doran & Gallagher group cut a 10-in. vein of lead-silver ore. The north cross-cut from the 120-ft. level has been started and has cut several small bunches of copper ore.—The first shipment of ore from Courtland over the Mexico & Colorado railroad went to Douglas August 17. Since that time from two to six cars per day have been shipped. From Douglas the ore is shipped over the El Paso & Southeastern tracks to the El Paso smelter.—Work has been suspended at the Germaine shaft of the Calumet & Arizona company to install a new boiler and pump. A good tonnage of ore is blocked out here and stopes will be started as soon as a switch to the mine is completed. George A. Arnold is manager. At this company's smelter the old furnace is being re-modeled, and when completed will have a capacity of 500 tons per day. The plant will then consist of three 500-ton and three 300-ton furnaces.

GILA COUNTY.

Samples from the 700-ft. drift of the Lost Gulch United Mines Co. in the Globe district assayed as high as 9% copper and \$100 gold per ton. The old quartz mill which was built by former owners of the property is being dismantled.—The Sullivan shaft at the Cordova mine opened a body of copper glance at a depth of 360 ft. The glance is in a gray schist similar to that found in the Miami and Inspiration properties.—During September the Arizona Commercial Copper Co. will commence shipping. The management expects to produce about 1,000,000 lb. of copper per month.

MARICOPA COUNTY.

J. W. Witherlay and associates have purchased the Golden property near Wickenburg. The building of the railroad through that portion of the country will reduce freight rates and is hoped will put the mine on a paying basis. Some high-grade gold ore has been taken out in the past.

PINAL COUNTY.

The Ray and Gila companies have closed their experimental mill at Ray and no more ore will be treated until the new plant is finished. The structural steel should be on the ground by September 1 and the work of construction started by the 15th of that month.

YAVAPAI COUNTY.

The Arizona Copper-Gold Mining Co. shipped a \$500 gold-bar as the result of a test run of the Lane mill recently installed at this company's plant on Cherry creek. The foundation was not heavy enough to stand the vibration and is being replaced.—The owners of the Mirably mine on Groom creek have leased a 5-stamp mill and will crush 50 tons of ore which they have on the dump. The vein which is from 12 to 20 in. wide has been cut by a 325-ft. adit and a drift driven along it for 150 ft. Average samples run \$35 per ton.—Operations have been suspended at the plant of the Octave Gold Mining Co. at Octave to install new machinery that will increase the capacity of the plant 25 per cent.

YUMA COUNTY.

The Yuma Copper Co. has been incorporated to continue development on its property in the Harecuvar mountains. There has been approximately \$40,000 spent on the property and some good copper ore opened.

CALIFORNIA.

ELDORADO COUNTY.

Some excellent ore is being opened by the drift on the 300-ft. level of the Mt. Pleasant mine at Grizzly Flat.—The shaft at the Morey property is down 50 ft. in ore.

INYO COUNTY.

The Casa Diablo Mining Co. has completed the installa-

tion of two carloads of mining machinery and has ordered two Leyner drills and a Leyner drill sharpener.—King brothers are to start their mill on ore from the Unthank lease on the St. Ives ground shortly. There is about 300 tons of \$15 ore and 40 tons of \$40 ore on the dump. The vein is from 12 to 18 in. wide in the bottom of the 125-ft. shaft.

MARICOPA COUNTY.

The owners of the Hite mine at Hite's cove are building a wagon-road from the mill to South Fork, the station on the Yosemite railroad. The road will be through a hard country to build in, but it will reduce the freight rates enough to warrant the expense. The Hite mine is an old one with a good record in the past, and with the wagon-road completed and new machinery installed should be a steady producer for a long time.—The South Fork Mining & Power Co. has a crew of surveyors at work running the lines for the ditches and dam at its water-right near Peach Tree.—The Trujillo Mining Co. has just completed its mill on Grizzly flat. C. G. Lewis is manager.

MONO COUNTY.

The Sierra Oil Co. has erected a derrick on the northwest side of Mono lake and started drilling for oil. The machinery is capable of drilling to a depth of 5000 ft., although it is anticipated that the oil-bearing shale will be cut before that depth is reached. Harry Soderberg is superintendent.

NEVADA COUNTY.

The cross-cut from the lowest level of the shaft at the Union Hill mine near Grass Valley cut the vein 700 ft. below the outcrop. This gives 300 ft. of backs on this vein, and the cross-cut will be driven to open several veins known to exist beyond this. It is the intention of the company to add 20 stamps to the mill. C. J. Graham is superintendent.—A shoot of rich ore was cut by the lower adit of the Red Ledge mine near Washington.—The 30-stamp mill, hoisting plant, and compressor house at the Eagle Bird mine near Maybert were completely destroyed by fire. W. M. Wilson, the owner, estimates the damage to approximate \$40,000.—Some excellent specimens of copper ore have been taken from the claims of Otto Woehler near Spencerville.—The North Star Mines Co. has purchased the stock of the Grass Valley Mining & Milling Co., which controls the Hermosa mine. The property has been idle for a number of years.—C. L. Wilson has bonded the Gregory group of claims, two miles from Moores Flat. There are nine claims in the group, which is situated in the southern portion of the Alleghany district.—The Eastern people who recently bonded the Red Cross mine near Omega have ordered a Huntington mill and will have it installed in a short time. A rock breaker is now being installed at the mine.—At the Oustomah mine a cross-cut is being driven from the 1050-ft. level to cut the vein.—The Dana mine in the Grass Valley district is to be opened. The property was recently bonded to an Eastern firm and the shaft unwatered. The shaft was sunk in an 8-ft. vein and the gold content has been of sufficient value to warrant the company planning more extensive development work.—The German mine in the Washington district has been bonded and a drift started on the vein.

SAN BERNARDINO COUNTY.

The recent negotiations for the sale of the Jumbo mine near Hart have been called off and the mine is again working after a shut-down of 60 days. The Foster brothers and Patrick McCluskey, who own the property are now planning to install a mill and hoisting machinery as an open-cut east of the shaft recently opened 20 ft. of \$30 ore.—The raise in the Oro lease of the Big Chief Mining Co. is up 40 ft. in ore of good milling grade. A 40-hp. hoist is to be installed at the Daton shaft in a few weeks. The shaft is now down 50 ft. and the company will sink to the 100-ft. level and cross-cut.

SHASTA COUNTY.

The Mammoth Copper Co. has added a 12 by 30-ft. experimental reverberatory furnace to its equipment. The object of the furnace is to make tests on the further recovery of

the copper content from the slag. The company is working about 110 men at the Quartz Hill mine and taking out about 300 tons of ore per day. This is in excess of the usual amount and a portion of it is being stored for use this winter. Two men were killed by a cave-in on August 21. The men were running a machine-drill in an untimbered portion of the mine.—Sharp & Todd have a contract to run several diamond-drill holes at the Summit group near Kennett.—The 6-mile spur from the Southern Pacific railroad to the Delta Consolidated mines on Dog creek has been completed and ore shipments will be started to the smelters at Kennett and Coram.—The carload of pig-iron recently shipped from the Noble electric smelter at Heroult to the Northern Engineering Works in Redding has proved satisfactory and is now being made into castings to be used in the Heroult smelter. The plant is running steadily, although some minor changes are still to be made in the machinery. About five tons of pig are being cast per day.—A small amount of paraffine oil was brought up by the sand-pump from the well the Terry Lumber Co. is sinking at Bella Vista. This well is being sunk for water, but a company has been organized at that place to drill for oil.—At a meeting of the Farmers' Protective Association at Anderson a committee was appointed to confer with the managers of the Coram and Kennett plants to see if a satisfactory arrangement could be made with the smelting corporations in regard to the damage done by the smoke to the crops of that vicinity.

SIERRA COUNTY.

At the Alaska mine near Pike City a drift is being driven east on the Contest level to tap the ore-shoots found in the upper workings. The raise in the shoot recently opened continues in a good grade of milling ore and it is expected to open a stope there shortly and start the mill.—The drift at the Oakland mine is in good ore. Frank B. Voyle is the owner.—The churn-drill to sample the old gravel channel in Reese ravine near Downieville has been hauled to the property and will be working in a few days. George McGee has charge of the work.—The adit of the Kieffer brothers at the Gibraltar mine has cut the gravel, but as yet the bedrock has not been reached, so its value is still unknown.—At the Hunch property near Alleghany a cross-cut has been started that will tap the vein at a depth of 100 feet.

SISKIYOU COUNTY.

Crocker & Frenet, of Eureka, are re-opening the Sugar Creek mine.—The lessees of the McKean mine near Calahan are milling some excellent ore.—Fred Dakin has purchased the Dewey No. 3 claim in Happy Camp from I. Hendrickson for \$4000. There is a good showing of copper ore on the surface.—John B. Farish has been examining copper properties in Happy Camp.

TRINITY COUNTY.

James Sallee, former owner of the Iron Mountain and Bully Hill mines in Shasta county, has been examining the Bonanza King mine near Trinity Center for San Francisco interests. The Bonanza King was controlled by men allied with the California Safe Deposit & Trust Co. and has not been active since that institution closed its doors.—The Trinity River Mining Co. has not turned the water through its tunnel, as was expected, owing to delays caused by the late delivery of a portion of its machinery. It is probable the plant will be in operation some time in September.—A. C. Cruchet, of the American Securities Co. of Boston, has obtained an option on the placer ground of G. A. Tinsley and H. W. Hudson near China Flat. A ditch and flume will be constructed and a No. 3 giant installed so the mine will be ready for operation next winter.—The New River Mining Co. is to take over the mining claims of the Noble brothers in the New River district. The first payment of \$1000 is due September 15. Theo. H. Minor is president of the company.

TUOLUMNE COUNTY.

A company is being organized in Sacramento to work the bed of the Tuolumne river below Stevens bar. Several attempts have been made to obtain the gold from the bottom of the river, as it is known to be rich at this point, but the

flow of water has been too heavy for the previous operators to get to bedrock. James Geddes, of Sacramento, is one of those chiefly interested in the enterprise.—The mill at the Street property is running on ore from the Atlas mine.—W. C. Faller, who recently bonded the Dorsey-Newcomer property, opened a rich vein of quartz on Knight's creek.—The Collier & Herbert property in the same district is being unwatered and the owners will deepen the shaft and work the ore as it is taken from the development work. There is an arrastre on the property and a small cyanide plant will be erected shortly. The vein varies from 1 to 2½ ft. in width and mills \$50 per ton.

COLORADO.

CHAFFEE COUNTY.

The new Kuenzel smelter at Buena Vista is running successfully on the ores of that district. Two cars of ore that ran \$86 per ton were shipped by Thorndale & Helman from the Decorruk mine to the smelter. There are two cars of \$35 ore from the Black Hawk mine on Murphy hill ready for the smelter.

CLEAR CREEK COUNTY.

(Special Correspondence).—A deal has practically been closed whereby the Virginia City mine is to be transferred to a syndicate of Eastern capitalists for a consideration of \$75,000. The property is owned by Maxwell & Hood, of Georgetown, and has been undergoing development for the last five years. The mine is credited with a production of \$250,000.—The working force at the Josephine mine on Kelso mountain now numbers 50 men. J. R. Sapp, the manager, expects to be sending out from 8 to 10 carloads of galena each month during the balance of the year. The ore is of a high grade and mills from \$60 to \$70 per ton in silver and lead. It is understood that a milling plant is to be installed this fall.—Ore assaying \$93 per ton was cut in the Star property in the Peru district. John O'Dea is manager.—Luzetti & Co., leasing on the Bismark vein, Sherman mountain, has cut a 16-in. streak of high-grade ore in a winze being sunk from the third level.—Shipments are to be started this month at the Culley adit on Saxon mountain. J. J. Culley is manager.—E. J. Butts shipped a carload of smelting ore from the Columbia property last week. The product was sent to the Argo smelter, and settlement was effected at the rate of 2.1 oz. gold and 18 oz. silver per ton.—It is stated that a working fund of \$20,000 has been subscribed for the development of the McKinley mine on Lincoln mountain. On the McKinley vein a streak of lead ore is showing that is from 6 to 10 in. wide and assays \$35 per ton in silver and lead. R. Emery is manager.—Work was resumed this week upon the Merimac group of claims on Kelso mountain. In the shaft workings a streak of \$70 gold-silver-lead ore is exposed that is from 4 to 6 in. wide. As soon as the vein is intersected in the lower workings an increased depth of 200 ft. will be attained.—The Central Colorado mine on Leavenworth mountain is to be developed upon a large scale. C. R. Iliff, of Denver, the owner, states that a company is being organized to drive the adit for 3000 ft. It is now in 350 ft., and for some little distance a streak of \$65 gold and silver bearing ore is exposed that is from 6 to 10 in. wide.

Georgetown, August 23.

GILPIN COUNTY.

The owners of the White Pine mine have leased the Penobscot mill in Gamble gulch and are running a test lot of surface ore through the plant. Ten stamps are running and two concentrators. Work has been resumed in the main Penobscot adit, although the heavy ground makes the progress slow.—A carload of ore was shipped to the Modern smelter near Argo from the Fagrellius mine in Moon gulch for a test run.—The Evergreen mill was shut down for a few days owing to a break in the machinery. A meeting of the stockholders of the Evergreen Gold & Copper Mines Co. was held in Denver recently, and it is reported that an additional force will be placed in the mine to keep the mill working to its full capacity.—Work has been resumed at the Golden Flint mill in Gamble gulch and 15 stamps are kept dropping. A. Bailey is in charge of the work.

GUNNISON COUNTY.

The Blaine Mining Co. at Gothic is repairing the dam which the high water damaged last winter and completing the mill. A cross-cut adit is to be started that will cut the vein at a depth of 500 ft.—Rinehart Holloway has opened a good ore-shoot on his claims in Rustler gulch.—At the Carter property a drift has been started on the vein cut 4700 ft. from the portal of the adit. The vein is 20 ft. wide, all of good ore. The largest portion is a milling grade, with a rich streak of smelting ore.

LAKE COUNTY.

Thomas F. Walsh, of Denver, is to consolidate a number of claims on Corinne mountain. The Corinne group and a number of others in that district have excellent showings and some little surface work has been done, but previously no deep mining attempted.—Harry Schraeder is shipping 200 tons per day from the old Ballard dump to the Leadville District mill.—The Horrigan brothers are to install an electric hoist at the shaft on the Highland Mary and Bobbie Burns claims near Leadville. The ore is still high-grade and is being sacked for shipment to the smelter.

OUBAY COUNTY.

It is understood that the properties of the Mono-Baltic Mining & Smelting Co. near Iron-ton is to be bonded and a smelter erected.—The Ross Mining Co. has commenced grading for the installation of a compressor plant and an electric hoist at the Congress mine near Red mountain. The shaft is now 300 ft. deep and it is the intention of the company to sink 250 ft. farther to the level of the Koehler adit on the San Antonio property and handle the ore that way. Patrick Lonergan is in charge of the work.—At the Legal Tender mine the shaft is down 100 ft. and a hoist is being installed to sink to the 350-ft. level, where cross-cuts will be driven to the contact. Edward Canavan is superintendent.—The raise at the Thistle-down is still in good milling ore.—The Bachelor mine has been unwatered to the second level by Gregory & Co. No attempt will be made to unwater the shaft farther at present, and it is expected the company will commence shipping from this level in a short time.

SUMMIT COUNTY.

There are two electric drills running in the Arctic mine and a large amount of ore is stored on the dump. The mill will be started as soon as the raise is completed to the second level.—The White Cloud Mining Co. has completed the installation of an electric plant in its mill in Summit gulch near Breckenridge and is planning on adding 10 stamps to the mill equipment. L. Simon is manager.—The Sallie Barber mine is shipping a high-grade ore to the zinc smelters.—The Wellington Mines Co. is shipping crude ore and concentrate.—A new crusher has been installed at the Blue Flag mine on Mt. Baldy.—The Gold Bell Mining Co. has purchased the Heter mill and moved it to the Mt. Baldy property.—The Gold Dust mill has been overhauled and is now ready to be operated. There are 500 tons of ore in the mill-bins.

TELLER COUNTY.

There are 30 sets of lessees at work on the property of the El Paso Consolidated company and it is expected the August output will approximate 2000 tons.—The Morris brothers shipped two cars of \$30 ore from their lease on the Morning Star mine on Bull hill.—Grant & McCloud, sub-leasing from the British American Mining Co., opened a 2-ft. vein at a depth of 65 ft. that assays \$280 across the width of the vein.—The Squaw Gulch Leasing Co. has purchased the hoisting plant at the abandoned shaft of the Golden Wedge claim and moved it to the Dolly Varden mine.—Cox & Whetmore have opened a large body of ore on their sub-lease in the Damon mine. A drift has been run 50 ft. on the ore and the vein cross-cut for 40 ft. At present the lessees are breaking 30 tons per day.—J. M. Wright, manager for the Joe Dandy Mining Co., announced that the Jo Dandy and Eclipse No. 1 claims of that company are to be leased shortly.—An ore-shoot that assays \$20 per ton has been cut in the T. E. M. O. M. J. mine by Gus Kelstrom and associates, who are now shipping the ore to the Cripple Creek plants.—Shipping ore has been

opened on the 700-ft. level of the Mollie Kathleen mine on Tenderfoot hill. The cross-cut is also being driven to cut a galena vein on that level.—The Nellie K. Gold Mining & Milling Co. has been incorporated to develop 50 acres on Galena hill north of Gillette.—On the property of the Granite Gold Mining Co., under lease to Furst and associates of Victor, a vein has been opened on the 900-ft. level that assays \$2000 per ton.—The Doctor Jack Pot Mining Co. will pay a dividend of $\frac{1}{2}$ c. per share September 1.

IDAHO.

BONNER COUNTY.

Arrangements are being made by J. Herbert Anderson to re-organize the Panhandle Smelting & Refining Co. and resume operations at Ponderay within 60 days. Present plans call for doubling the capacity of the smelter plant and the building of a branch from the Spokane International railway to the works. It is reported that the Montana Mine Owners' Association has withdrawn from the directorate by the resignation of Albert Wonderlich, of St. Paul, W. L. Hewlett, W. A. Clark, W. G. Conrad, and A. E. Spriggs, of Montana.

IDAHO COUNTY.

The Penn-Dixie Gold Mining Co. has commenced grading for a 4-stamp mill and cyanide plant at its mine near Elk City. No. 3 drift is driven 150 ft. in a 4-ft. vein and a winze sunk from the face 40 ft. in the same ore. No. 2 adit is driven 300 ft. to cross-cut the vein and opened 8 ft. of ore, while No. 3 adit has cut 22 in. of high-grade ore. W. L. Sendker is superintendent.—The No. 1 adit at the Buster mine cut a new shoot of ore under the rich croppings on the top of the hill. J. F. Thorn is superintendent.—The Majestic mine is to be re-opened shortly.—The Larson, Perry, and Brown properties on Rett creek have been bonded and development work is to be started. The dike covered by these claims is 600 ft. wide and has been opened by a 400-ft. drift.—The main adit at the Golden Crown property opened 5 ft. of ore that assays \$6 per ton.

KOOTENAI COUNTY.

The Princess Panama Mining & Smelting Co. at Lake Pend O'Reille have blocked a large amount of ore and are preparing to make a shipment to the Tacoma smelter. The vein has been opened for 4500 ft., with sulphide nearly all the way. James W. Ferguson is manager.

OWYHEE COUNTY.

An average of six samples taken by William Caldwell from the Potosi mine was \$178 gold and 69 oz. silver per ton.—The adit at the mill level of the Banner mine has opened several stringers of ore.

SHOSHONE COUNTY.

At the Star mine near Mullan, 4 ft. of galena ore was opened by the east drift when in 1000 ft. The property adjoins the Morning mine.—On the Carney group a 90-ft. drift has been run in chalcopryite ore.—The ore in the face of the drift recently started on a small seam in the Reindeer mine has widened to 4 ft. of copper ore.—The drift on the 500-ft. level of the Caledonia mine is in 30 ft. on the vein. A portion of the ore is free milling and a portion of shipping grade.—A drift has been driven 500 ft. on the vein at Idaho Northern group near Murray, giving 175 ft. of backs.—The mill at the Monarch mine east of Murray is being enlarged to crush 200 tons per day. The raise is up 430 ft. from the lowest level and the ore opened assays 65% lead and 12 oz. silver. E. P. Spaulding is manager.—The adit at the Blue Bell property on Big creek has been driven 400 ft. to cut the vein and 300 ft. along it. The vein at the point of intersection was 2 ft. wide, but has now increased to 6 ft. Gus Nelson is manager.—Assays on the ore from the veins opened on the property of the Transcontinental Silver & Copper Mining Co., near Mullan, ran from 1 to 7% lead, with several ounces of silver. One of the veins has been opened for 300 ft. along its length and a cross-cut driven across it for over 80 ft.—A contract has been let to drive the lower adit of the Cedar Creek Mining Co. an additional 500 ft. The adit is now in 170 ft., and when the cross-cut opens the vein the rest of the distance called for by the contract will be driven along

the vein. The property is situated east of Murray in Granite gulch.—About 200 tons of lead ore per month are being shipped to the smelter at Salida from the Bear Top mine. The mill has been overhauled and is saving 45 tons of zinc concentrate per month, which the company will ship to Denver or Cleveland. George Kiebler is manager.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The Old Judge mine and mill at Oronogo was sold for \$50,000.—The Oronogo Mining Co. has repaired its No. 2 plant and increased its milling capacity to 800 tons per shift. Four other plants are running on the property, with a capacity of 200 tons per day each.—The General Lead & Zinc Co. has started its recently enlarged plant. The mill has a capacity of 150 tons per day and is handling ore from the 190-ft. level.—The Old Dominion Co. has just completed a 350-ton mill for the Puritan Mining Co. in Gordon Hollow, where a number of companies are trying to open the lower formation, which assays from 7 to 8% zinc.—The Columbus Mining Co. has let a contract to build a 150-ton plant near the old Bumblebee property.—The Little Persimon Co. at Carthage is completing a 150-ton mill and will be operating in a short time.—Among the most important recent discoveries is that of A. F. Dexter at Carl Junction, where 90 ft. of ore has been opened by the third drill-hole. The Providence shaft of Webb City is being sunk 20 ft. deeper in a sheet formation that assays 4% zinc. A number of companies in this neighborhood are taking up old stopes and getting good returns.—The Little Pearl Mining Co. west of Joplin has just sunk a shaft through an excellent orebody, 4 ft. of which is almost solid ore, the rest averaging 15% zinc.

Joplin, August 21.

MONTANA.

CHOUTEAU COUNTY.

Operations have ceased at the property of the St. Joe Quartz Mining Co., 30 miles above Avery. Several large loads of mining machinery were on the way to the mine when the order came to shut down. John D. Rockefeller is one of the principal stockholders.

MISSOULA COUNTY.

The Bryan mine at Saltese is to commence shipping to the smelter shortly. The ore is of the lead-silver type with a small gold-copper content.—Stockholders of the Rex Mining Co., operating at Minemile, will meet at Augusta, Maine, September 11, to consider a proposal submitted for a 20 years' lease on the group. The lessees would have to spend \$50,000 in development in opening the mine before beginning to mill and ship.—At the Dennemore property near Saltese the cross-cut adit opened 8 ft. of copper ore. The company expects to sink on this shortly.—A 19-drill compressor and hoisting plant has been installed at the Iron Mountain property near Superior, and a contract let to sink the shaft an additional 150 ft. This property has been a heavy shipper in the past and it is expected to resume shipping in the near future.

NEVADA.

ESMERALDA COUNTY.

At the Florence mill four new Card tables have been set in position and a tube-mill is being installed. This added equipment will raise the capacity of the mill to 160 tons per day. When the addition is completed the ore will be drawn from the Little Florence shaft, and the main Florence shaft enlarged to three compartments.—B. E. Thomas, operating a lease on a claim of the Columbia Mountain Mining Co. on Columbia mountain, opened a rich streak of ore at the bottom of a 125-ft. shaft.—All of the Wingfield properties outside of the Combination ground have been opened to lessees.—On the Poleverde claim of the Jumbo Extension property the 300-ft. shaft is to be deepened to 1000 ft. and cross-cuts run in an attempt to find the continuation of the orebody opened by the Clermont shaft.—The Victor shaft of the C. O. D. Consolidated is to be sunk from the 450 to the 550-ft. level. The sump at the last level opened a vein of quartz but as yet no prospecting has been done upon it, and it is the intention of the management to

open this at the lower level.—A heavier hoisting plant is to be installed on the Garrison lease on Atlanta ground and the shaft sunk to the 550-ft. level. At the 450-ft. level a cross-cut opened a vein which was not of shipping grade, but it is hoped by the management that it will prove profitable on the lower level. The lease is controlled by W. P. Garrison, of Pasadena.—A cross-cut from the 150-ft. level of the Knickerbocker lease on the Blue Bull opened the vein. On the 100-ft. level this vein assayed from \$30 to \$50 per ton, and it is hoped that it will prove of the same value at the lower level.—E. A. Wheeler, S. Canman, and I. H. Cook, of Goldfield, have purchased the Murray 10-stamp mill, the Victor lease, and a portion of the Proskey No. 1 lease at Rawhide. On the Victor ore has been opened from the 135 to the 150-ft. level and four stopes are being worked. On a four days test run on 160 tons of Victor ore a \$4000 gold bar resulted.

EUREKA COUNTY.

Patrick Clark, Dan P. Bagnell, and associates, of Spokane, have organized the Hidden Treasure Mining Co. to take over a group of claims in the Cortez range. An oxidized ore assaying \$25 per ton was cut on the surface, and at a depth of 80 ft. \$80 sulphide ore was opened. The nearest station on the Southern Pacific is Beowane.

NYE COUNTY.

(Special Correspondence).—The Thanksgiving has resumed activities after a long period of idleness. The shaft will be sunk to the 550-ft. level.—A 4-in. shoot of \$150 ore has been struck at a depth of 50 ft. in the Ruth lease on Union No. 2 of the Manhattan Dexter.—The Dexter is installing a hoist and pump to operate below the 275-ft. level.—The Buckeye will be re-opened within a few weeks.—The shaft at the Tolyabe is down 160 ft. on a vein assaying from \$1 to \$40 per ton.—Three shifts are at work on Indian camp. A 10-stamp mill, tube-mill, and cyanide plant, with a daily capacity of 60 tons, will be installed. Electrical machinery is being placed in position.—Placer mining continues to attract principal attention. Local miners assert that the main gulch has been proved for seven miles. The deposits vary from 40 to 80 ft., a large portion of the ground being valueless on the upper strata, but rich near bedrock. The lateral gulch is 10 to 14 ft. deep.—On the Happy Day 10,000 cu. yd. of \$10 gravel are said to be developed.—The Goldfield Bald Mountain Consolidated Co. is opening a large body of gravel at Central. The suction dredge recently installed by Sacramento people is said to be operating satisfactorily.

Manhattan, August 23.

(Special Correspondence).—At the Tonopah mine a large body of ore is being developed on the 600-ft. level, east of the Mizpah shaft. It is reported to assay \$70 per ton and has been opened for 150 ft.—The Tonopah Merger Co. has been organized with 1,000,000 shares, par value \$1, to operate the Golden Anchor group. Additional ground will be purchased and the indebtedness of the Golden Anchor liquidated, according to the plans of the promoters.—Work has been resumed on the 765-ft. level of MacNamara. The company is shipping more ore to the smelters than at any time in its history.—Operations at the Belmont have been slightly retarded while the electric hoist and big compressor were being repaired. The company is shipping nearly two tons of cyanide precipitate and 150 tons of concentrate to Selby each month.—The Nevada-Bellehelen, in the Bellehelen district, is shipping and employing 12 men. The Horseshoe lease has opened a body of fair-grade ore on the Harwood.—It is reported that the Scioto Mining & Milling Co. will erect a custom mill.—The Tonopah Mining Co. has advanced the Nevada Copper Co. \$20,000 for development. The Tonopah company holds the majority interests.

Tonopah, August 24.

WHITE PINE COUNTY.

The fourth unit of the concentrator was turned over to the Steptoe Valley Smelting & Mining Co. after a seven-day trial run. This unit raises the capacity of the McGill plant to 6500 tons per day, all of which is coming from the steam-shovels at Copper Flat. Recently the record for production was broken at Copper Flat by the shipment of 140 cars per

day. This rate will only be continued till the bins at the smelter are filled, when the production will be lowered to 120 cars per day.—Three of the Giroux drills have been moved to the Butte Ely ground, upon which the Giroux company has an option.

OREGON.

BAKER COUNTY.

At the Amazon property in the Greenhorn district a drift has been driven 200 ft. on the vein which is 30 ft. wide. When completed this drift will give 290 ft. of backs on the vein, which is largely free-milling ore. W. F. Prier is superintendent.—Two carloads of machinery for the Cougar mine arrived in Sumpter and is being forwarded to the mine.—The All Metals Recovery Co. of Denver is building a reduction plant on the middle fork of John Day river to treat the output of Ornament, Surprise, and Tiger properties on Greenhorn mountain.

GRANT COUNTY.

The Kennerly Gold Mining Co. is sinking the Ophir shaft to the 200-ft. level. The company is stoping on the first level and has 10 stamps dropping in the mill. The concentrate is hauled in wagons to Austin and shipped to the smelter at Tacoma.

UTAH.

JUAB COUNTY.

Thomas Griffith and Charles Smith shipped a carload of lead-silver ore from their lease on the Utah Consolidated property to the Tintic smelter, the returns on which approximated \$1500.—The Tintic Standard shaft has been timbered to the 400-ft. level and a station cut at that point. New pumps have been installed and the shaft started for the 600-ft. point.—The Tintic Smelting Co. has blown in its fourth unit and the management has sent letters to its customers stating that it was in a position to again accept custom ores.—The property of the Swansea Consolidated Mining Co. at Eureka has been unwatered and a contract let to deepen the shaft 200 ft. This work will sink the shaft to the 1200-ft. level, and here cross-cuts will be run to explore the orebodies on that level.

IRON COUNTY.

The work of installing the new \$50,000 power plant at the Gold Springs mine is to be done by the F. C. Richmond Machinery Co. and will be completed by December 1.

MILLARD COUNTY.

The Antelope Mining Co. in the Blackrock district has opened an 18-in. vein of lead carbonate by a cross-cut adit. The adit is being driven to tap the bottom of the shaft sunk on a vein of copper. The shaft will be continued at that point and a cross-cut driven to the second vein at the lower level.

SALT LAKE COUNTY.

The smelter of the Yampa Smelting Co. at Yampa was seriously damaged by a cloudburst last week. The force of the water threw the ore-bins over, and the water striking the matte caused an explosion that destroyed the reverberatory furnace. The office and store-room of the company were completely destroyed. The tracks have been cleared and one of the blast-furnaces started and the company will continue with a curtailed output until the rest of the plant can be put in running order. The damage is estimated at \$75,000.—The South Columbus Mining Co. has levied an assessment of 5c. per share to raise money for further development work. The company has cut several bodies of carbonate ore, but freight rates are too high to admit of profitable shipping.—The Utah Copper Co. has enlarged its Copperton plant to increase its capacity to 1000 tons of ore per day.—A delay in the completion of the Ohio Copper Co.'s mill has been caused by the contracting firm failing to deliver the structural steel on time. This will delay the opening of the mill until some time in October.

SUMMIT COUNTY.

The Silver King Consolidated Mining Co. has entered suit against the Silver King Coalition Mines Co. in Park City to recover \$5,500,000 as damages for ore claimed to have been removed by the latter company from the Vesu-

vius and Andes claims which the companies own in partnership.

TOOELE COUNTY.

The Western Utah Copper Co. is installing a new compressor and will start work on the 500-ft. level as soon as this work is completed. Good copper-gold-silver ore has been opened on the 300 and 400-ft. levels.

UTAH COUNTY.

The Sierra Mining Co. has been organized at Provo to operate a group of claims which the company has bonded at American Fork.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The lessee of the Quilp mine has shipped two carloads of ore, about 90 tons, to the Granby smelter and has two more ready to ship.—The property of the Lorraine Copper Mining Co. in Keller is in the hands of a receiver and advertised for sale.—A meeting of the Illinois Mining Co. took place in Keller, August 17, when plans were formulated for more extensive development of the company's property.

Republic, August 23.

KITTITAS COUNTY.

A rich discovery has been made on the Jordan and York claim, 1½ miles north of Meaghersville. One piece of ore, 18 in. long, contained about \$300 worth of gold.

OKANOGAN COUNTY.

(Special Correspondence).—The shaft on the Forty-ninth Parallel mine, near Oroville, is down 100 ft. Some rich copper ore has been opened.—The Milwaukee Gold Sands Mining Co. has put a force of men at work on its placer claims, on the Similkameen river, two miles west of Oroville.—The Oroville Consolidated Mining Co. held its annual stockholders' meeting at Oroville, August 7, and elected E. Maccommon president. The company will sink the main shaft on the Sunset group to a depth of 400 ft. and on the 300-ft. level a cross-cut will be driven westward about 400 ft. to tap the Sunset vein. Some rich ore is being mined from a 6½-ft. vein of copper ore. Capital is being raised in New York for development.—The vein of the Rich Bar mine is 8 ft. wide, of which 4 ft. is good payable ore. Fresh capital is being raised for development.

Oroville, August 24.

CANADA.

BRITISH COLUMBIA.

The foundations for the compressor plant for the Greenwood-Phoenix tunnel have been laid and the machinery will be installed as soon as the cement hardens.—The Black Jack claim in the Central camp has been bonded by the Canadian Consolidated Mining Company.

ONTARIO.

A compressor plant is to be installed on the property of the John Black Mining Co. in Cobalt.—On the Imperial Crown a subsidiary company of the Crown Reserve, a 4-in. vein of calcite with cobalt bloom and smaltite has been stripped for 100 ft.—On the Silver Alliance at Elk lake an 8-in. vein of good ore was opened at a depth of 25 feet.

MEXICO.

JALISCO.

Luis Chevrillon has purchased the Mina Grande in the Hostotipaquillo district for English and French interests from the Dwight Furness Cp. The price is said to be \$75,000. The Mina Grande has been worked as a 'glory hole' in the past, and is credited with a large production. The new company will open the property through deep adits. W. A. Hoeing will have charge of the operations.—Frank W. Page, manager for the Lawson Development Co., is authority for the statement that the company's new plant in the Mascota district would be ready to accept custom ore. The mill is now running on ore from the San Jorge mine.—The Lupita Mines Co. in the Mascota district has resumed development work and is to install hoisting and power drilling machinery shortly. Patrick Fitzgerald is manager.—There is \$50,000 worth of ore on the dump at the San José de las Agujas mine near Vavidad that the owners expect to ship to the Lawson Development plant shortly.

Special Correspondence.

LONDON.

Botallack, Cornwall —Mount Morgan Report. — New Taxes in Great Britain.

Several times during the last year or more reference has been made in these letters to the Botallack tin mines in Cornwall which have been re-opened by the Allen & Meyerstein group. These mines are of historic and sentimental interest. They have produced largely in years gone by, and they possess a glamor, owing to their situation on the rocky cliffs near Lands End. It is now two years since the company was formed for the purpose of re-opening them, and though some £60,000 have been spent on development and machinery the mine is not yet in a position to yield regular supplies of ore. This fact is not a reflection on the managers or engineers, but it points out clearly the old axiom that it is more difficult to re-open an old mine than to open a new one. No records were ever kept at Botallack, in which it resembles all the old Cornish mines. The workings had been left in a poor condition, and in some places it looks as if the former owners had abandoned certain parts of the mine on account of collapses rather than from exhaustion of ore. The amount of work required in clearing the shafts and levels, and in combating the water that flowed in from unknown and unexpected sources, has been extensive. A 20-stamp mill and dressing tables have been in operation for over a year, and have treated ore from the dumps, and low-grade ore that had to be cleared out of the levels. It is only quite recently that really payable ore has been found, some in the old stopes and some in new ground, though its extent is as yet unproved. The engineers recommend that the new Allen shaft shall be sunk to greater depth in order that this promising ground may be exploited. As the company has come to the end of its financial resources, income bonds and debentures are being created. At the present time £10,000 is being asked for, but it is evident from the company's reports that quite £50,000 will be eventually required. The company has already mortgaged its property to the Cornish Consolidated Tin Mines, Ltd., the parent company of the Allen-Meyerstein group, as security for advances of working capital, and it is not quite clear how the new issue of debentures and income bonds will stand in connection with this mortgage. It must be confessed that the expectations of the promoters have been realized, the proof of this being the presence at the mine of another 20 stamps delivered some time ago, but not yet erected owing to the absence of ore to treat.

The report of the Mount Morgan Gold Mining Co., of Rockhampton, Queensland, for the year ended May 31 last shows results which are better than might have been expected. It will be remembered that during last autumn a number of accidents occurred owing to the creeping of the ground. It was found necessary to modify the methods of mining, and in the meantime the supplies sent to the mill were interfered with. There are three different sets of plant. One is the battery for treating the oxidized ore; the second is the chlorination plant which deals with pyrite, and the third is the smelter which treats the copper pyrite. The first-named source is becoming exhausted, and will be closed in the near future. During the year in question, 108,191 tons of oxidized ore yielded 17,236 fine ounces, and the contents have dropped to 3.19 dwt., as compared with 12½ dwt. in 1903. Of sulphide ore 106,952 tons yielded 48,284 oz. gold and 453 tons of copper. The ore treated in the smelter amounted to 183,568 tons and yielded 5346 tons of copper and 72,822 oz. gold. These figures are not substantially different from those of a year ago, but if it had not been for the accident the extended accommodation recently provided would have handled a greater output. It is interesting to note that the blister copper will before long be treated at the new electrolytic refinery at Port Kembla, New South Wales. The profits for the year amounted to £228,215, out of which £200,000 has been distributed as dividend.

In a recent issue some information was given relating to

the proposed tax on ungotten minerals in Great Britain. The proposition was to impose a tax of one halfpenny per pound every year on the estimated value of the known coal deposits and ore reserves in metalliferous mines. It is not necessary now to go over the arguments for and against such a tax, as this has been done in previous letters. It is only necessary to announce that the Government has abandoned the proposition, and intends instead to introduce a new tax on royalties.

NEW YORK.

Purloining Collateral.—Sutter Creek Company.—New Mining Stocks.—Temiskaming Difficulties—Greene-Cananea.

The district attorney's office is investigating mining stock frauds which may lead to extraordinary disclosures affecting prominent brokers on the New York Mining Curb market. Recently F. A. Heinze was asked if he could use \$50,000. As he has been severely punished in recent years by the so-called 'Standard Oil crowd', and is involved in many legal tangles, he felt that he had plenty of use for such a sum. What collateral could he put up, was next asked. Plenty of good active mining stocks, Heinze replied, and he named some of them. Finally a loan of \$50,000 for six months at 6% was arranged, and stock of the Davis-Daly and Ohio Copper Mining companies, both of which are controlled by Heinze, was placed with the Windsor Trust Co. as collateral. The day the collateral was placed with the Trust company, a man named Donald Persch informed a Curb broker named John Sherwood that he had a loan of \$50,000 with the Windsor Trust Co., and that he would like Sherwood to take it up so as to release the Ohio and Davis-Daly stocks, placed as collateral. Sherwood was authorized to sell the stock, and to pay the difference between the selling price and the loan to Persch. Sherwood, acting on these instructions, sold a large amount of the stock, and took Persch's order, and the sum of \$50,000, to the Trust company's office. The company willingly returned the whole of the securities to Sherwood on receiving the \$50,000. A couple of days later, Heinze's broker, on purchasing a lot of Ohio Copper shares to protect the market price, discovered some of the shares that had been pledged with the Trust company. He informed Heinze, and the latter communicated with the district attorney. Traps were set, and the whole scheme was uncovered. This is not the first time Heinze's stock has been similarly treated. The district attorney's assistants have found that several times this year similar transactions were carried out on similar lines through the Carnegie Trust company. Curb brokers state that such transactions have been quite common on the Curb recently, and that the gang involved has obtained sums of money from mining stock owners running into several figures. A number of arrests have been made in connection with the frauds and others are pending. The Heinze stock losses will fall chiefly upon the Trust companies. The losses of other stock owners, in many instances, will have to be borne by the owners. The disclosures at present relate only to the theft of mining stocks in New York. There is good reason to believe, however, that later developments will show that similar frauds have been carried out in Boston and in other cities.

A syndicate has incorporated, under the laws of Arizona, a mining corporation with a capital of \$5,000,000, and shares of a par value of \$1 each, to operate a gold mine at Sutter Creek, Amador county, California.

The stock of the Tenabo Mining & Smelting Co., and the Boston & Goldenville Mining Co., have been listed on the New York and Boston Curb markets. The former company was incorporated under the laws of Nevada last year with a capital of \$3,000,000. The company owns a group of copper claims in Wyoming. Development operations have, to date, disclosed upward of \$500,000 worth of ore. The Boston & Goldenville mine is situated at Goldenville, Nova Scotia. It is owned by a Boston company which proposes to make the stock active on the Curb markets. For several weeks past Cobalt stocks have been heavy on the New York Curb market, notwithstanding favorable reports of developments in some of the larger mines. It now

appears that investors are not desirous of dealing in Cobalt stock until the affairs of the Temiskaming and one or two other companies, about which unfavorable reports are circulating, are straightened out. Stockholders of the Temiskaming, which was active in curb-trading early in the year, accuse the directors of market rigging, and call upon them to issue a complete statement as to the company's financial affairs. At the beginning of the year, when attention was given on the exchanges to Cobalt stocks, the Temiskaming directors declared a 6% dividend. They were severely criticised for this, as the published statements of the company did not indicate that it was in a position to make such a disbursement. On June 12 the Directors met and decided that the company was not in a position to declare another dividend. Important brokerage houses in Toronto and New York have sent circulars to the stockholders of the company urging them to demand the Directors to call a meeting to disclose the company's financial position. The company was registered under the laws of Ontario, which provide that upon a requisition by shareholders representing one-tenth of the total number of shares outstanding, the Directors shall call a special general meeting of shareholders to consider such subjects as are mentioned in the requisition. This will undoubtedly be done, and as some of the charges to be made against the Directors are of a sensational nature, much public interest will be awakened. In the meantime Cobalt stocks remain dull and inactive.

In the last 13 months the Greene-Cananea company produced 45,405,000 lb. copper, 1,027,745 oz. silver, and 6616 oz. gold, at its mines in Sonora, Mexico. The returns for July were 3,508,000 lb. copper, 69,975 oz. silver, and 438 oz. gold. The company is now producing copper at a little below 10c. per pound. The directors are discussing plans for the reduction of the company's capital below the present figure of \$7,000,000.

TORONTO, CANADA.

Stock Market.—South Lorrain.—New Silver Field.

The stock market has been characterized by unusual activity for the middle of August. There has been no general or decided advance in prices, but one stock after another has experienced a boom usually following the report of a fresh discovery, which has stimulated speculation mainly among professional traders. This has been generally followed by a recession to about the former figures, but in some cases the advance has been unprecedentedly brisk. Beaver has had two or three spasmodic upward movements lately on the strength of reported new discoveries of rich ore, but the public is disposed to scepticism, as the Beaver veins have an awkward trick of faulting, and boomsters have a way of announcing the picking up of an old vein in a new place as a fresh find.

Mining is going on actively in the South Lorrain district, where about 2500 men are at work. Shipments have begun, the Keeley and the Wettlaufer shipping two cars each. Among the mines in this camp having well equipped plants are the Montrose Cobalt, the Murray, the Magna Cobalt, and the Harris Lorrain. The Silver Eagle has ordered a plant. These mines are controlled by syndicates, and have so far placed no stock on the market. A new silver field has been discovered in the township of Otter, 25 miles north of Thessalon, in the district of Algoma, where two prospectors made the first find last fall, keeping it quiet until they had secured their locations this spring. The news having become public a rush has set in, many having gone from Cobalt and Gowganda. Calcite veins in the diabase have been found as wide as two feet on the surface, and in some cases native silver has been discovered. The prospectors are asking the Government to open a recording office for claims at Thessalon. A large number of members of the British Association for the Advancement of Science, who have come over to attend the annual meeting at Winnipeg, are taking a side trip to the mining regions of northern Ontario in charge of Willet G. Miller, Ontario Provincial Geologist. They were at Cobalt on August 18, where they inspected the leading mining

properties, and after a short stay left for points farther north.

DENVER, COLORADO.

Trans-Mississippi Congress and the Forest Service. — Mining Congress Plans.—Topeka Mine.—Rout County.—Mexican Cement.

Attention in Denver this week has been centered on the Trans-Mississippi Commercial Congress, which has been in session at the auditorium. There was a large and representative attendance, but no lively debates until the last two days when topics relating to the Forest Service and the Public Lands were up for discussion. The Colorado delegation was naturally the largest, and in certain particulars dominated the Congress. Colorado has been restive under the recent administration of the Forest Service and the Land Office, and there was a disposition to indulge in sharp criticism. Under the leadership of ex-Senators T. M. Patterson and Henry Teller, resolutions were introduced designed to rebuke what is called here 'Pinchotism'. F. C. Goudy championed the Governments cause, and proved an able fighter, since he won from an evidently hostile audience, a compromise resolution which takes out all of the sting. The incident is worth noting, since it shows that even here where criticism of the Forest Service is most bitter and wide-spread, it has more friends than enemies. The general sentiment is that the Congress is no longer a fighting organization, and that to some extent, at least, it has become so broad as to obscure its peculiar field of usefulness.

The official call for the Goldfield meeting of the American Mining Congress, September 27 to October 2, has been issued by J. F. Callbreath, Jr., the secretary. It seems likely that discussion will centre mainly on means for stimulating the use of silver, the proposed tonnage tax for meeting the damages due to explosions in coal mines, the projected Federal Bureau of Mines, and the Governmental land policy. Since W. B. Heyburn, Senator from Idaho, and a well-known critic of the Forest Service, is to speak, a lively discussion is anticipated. Among others who have agreed to take part are, E. B. Kirby, S. A. Taylor, H. H. Lang, James H. Fox, H. S. Joseph, D. B. Rushmore, W. C. Ralston, G. O. Smith, Douglas White, Clay Tallman, Chas. J. Moore, L. O. Ray, and Victor C. Alderson. J. J. Hill and R. A. Ballinger will prepare papers, though they may not be able to be present in person. Mr. Callbreath is now in California making preparations for the meeting.

The Topeka mine on Quartz Hill in Gilpin county, has become the sole property of Henry P. Lowe by purchase of the half interest heretofore held by Tyson Dines. The mine was one of the first discovered in this district, and has a long record as a producer. The vein is 4 to 16 ft. wide in parts of the mine, and much rich ore has been extracted. It has been idle for nine years, owing to litigation, but is now being unwatered. The shaft is to be sunk and connection made with the Newhouse tunnel. The breast of the latter is now well in the producing portion of Gilpin county and long-deferred connections are about to be made. The tunnel is already paying interest on its bonds, and it seems that the stockholders are about to be rewarded for their years of waiting.

Rout county has recently come to the front, in the newspapers, and high-grade gold ore was said to have been sent out. A wild stampede resulted. The reports prove to have been fraudulent, but, as often happens, it seems likely that good will come of the rush, since a number of good properties have been located, and some \$100 ore actually shipped. Colorado and Kansas capital are interested in a portland cement plant which is shortly to be erected near Juarez, Mexico. A tract of land on which there are large deposits of limestone and shale has been purchased. The material has been thoroughly tested and arrangements are being made to erect a 2400-bbl. plant. As this will be only the second plant in Mexico, a country which uses 1,500,000 bbl. of cement yearly, the prospects of success are good. W. A. Haggott, of Idaho Springs, has been active in the enterprise, and has associated with himself experienced American cement-makers.

JOHANNESBURG, TRANSVAAL.

Mine Air.—A New Explosive. — Industrial Activity. — Mineral Production.—Transvaal Iron. — Rand Collieries' Development Methods

The Mining Regulations of the Transvaal stipulate that the inflow of fresh air into a mine shall be not less than 70 cu. ft. per man per minute. Like many other Government regulations of excellent purport, it means but little. So long as a mine's atmosphere is not notoriously impure, no unreasonable interference by the officials is experienced. The economic advantages of good air have always been the most important factor in prompting the improvement of ventilation. Although there has lately been upon the Rand, a good deal of 'playing to the gallery' in this matter, and much pretentious advertisement of ventilation schemes which many a coal-miner probably learnt upon his father's knee, there is no doubt good scope for progress and improvement. The problem of ventilation is being attacked from two points of view. First, the engineer concerns himself with the provision of free air to remove the danger of gases, and second, the chemist sets himself the task of minimizing the production of noxious impurities. The manager of the Modderfontein dynamite factory, W. Cullen, and his assistants, now claim to have made a great advance in the right direction by inventing a 'modified explosive' (there are reasons for the lack of closer description), which is as powerful and as cheap as blasting gelatine, but which gives off no CO. Mr. Cullen is too thorough in his methods to make public announcement to this effect, as he now has done, without being satisfied with the finality of his results, the outcome of three years of experimenting. Ordinary blasting gelatine is used almost exclusively in development, and largely in stopes. This, Mr. Cullen asserts, produces CO in 'incredible' quantities, while his new compound (in which, however, it is naturally impossible to introduce sufficient potential oxygen to oxidize the products of the time-fuse combustion), yields it in 'negligible quantities'.

The great wave of activity which developed into a mining and financial boom of some magnitude in June has been checked. Apart from the fact that the buying of shares in worthless undertakings, and the pegging of claims regardless of mining possibilities, were carried to an extreme, the principal course of the present reaction is probably the gloomier aspect of the native labor position. There is a heavy 'wastage' of three or four thousand Kafirs per month, while the requirements of the industry are rapidly expanding. If the shrinkage is soon checked, the temporary shortage will appear more beneficial than otherwise, and will remind the mine-controllers that there is danger in reckoning without their host. The statistics of mineral production in the Transvaal for June show that there has been a small decrease for the half year as compared with the latter half of 1908. The returns are as follows:

| | |
|---------------------------------------|-------------|
| Gold | £15,472,409 |
| Diamonds | 580,807 |
| Coal | 437,555 |
| Base metals | 191,436 |
| Silver contained in gold bullion..... | 41,578 |

£16,723,785

The total for the six months to December 31, 1908, was £16,830,275. Gold and diamonds show a decrease, coal and base metals (notably tin), a fair increase. The Government Mining Engineer has issued a brief report upon the iron ore resources of the Transvaal. With regard to the known deposits, namely, the titaniferous magnetite in the Pretoria district, and at Magnet Heights, the hematite near Middelburg, the ferruginous quartzite and ilmenite near Pretoria, and the 'inexhaustible' bodies of chrome iron ore, the report adds little to public knowledge, but it is of significance in its revelation of the Government's probable attitude toward the future industry. The memorandum recommends the provision of bounties of 15s. per ton, diminishing by 1s. 6d. annually, and also the guarantee of 5% interest on the pioneer company's capital for five years.

A monopoly should be ensured for the venture which first enters the field under approved conditions.

The directors of the Rand Collieries, Ltd., a deep-level gold mine in the East Rand, have determined to adopt a scheme of development which has long been considered economically advisable under certain conditions obtaining on the Rand. Instead of following the 'reef' as hitherto, they will drift in straight lines "in order to traverse the blocks of ground with minimum footage, and therefore cheaper development costs, and also with a view to facilitating tramming operations at a later date." There will certainly be cheaper development costs, but this will be offset by the poorer, that is to say, less informative, developments results. Cross-cuts will be run at intervals of 40 ft. "Therefore", it is announced, "no value can be assigned to the blocks opened up in this manner except at the points at which the cross-cut raises expose the reef." It is when the cross-cut raises fail to cut the reef as expected that the trouble begins. One would like to know a good deal about the character of 'reef-conditions' before deciding upon these straight drifts for mechanical haulage, for in a highly faulted property, (as the Rand Collieries is admitted to be), and where much has to be learnt concerning the average gold-content and percentage of pay-ore, there is a good deal to be said in favor of the old-fashioned method of clinging to the vein, and of regaining it as soon as possible when faulting throws it from the normal course.

ROSSLAND, BRITISH COLUMBIA.

Change of Management at le Roi No. 2. — Silver King. — Dominion Copper Affairs.—Work at B. C. Copper.

There has been a change in the management of the Le Roi 2, Ltd., Paul S. Couldrey, who has been in charge of the property for over six years having resigned to take an office with the B. C. Copper Co. Under the régime of Mr. Couldrey the Le Roi 2, Ltd. has paid steady dividends of nearly \$2 per share per annum. Ernest Levy, who is well acquainted with the conditions here will succeed Mr. Couldrey. It is not likely that there will be any radical change in the policy of the company.

Mining operations at the Silver King mine, at Nelson, will be crippled for some time, as a fire has destroyed nearly all of the surface buildings and has damaged the tramway. The Athabasca mine has been secured by a syndicate of Nelson men who have begun to unwater the mine. Things are still in an uncertain state in Dominion Copper affairs. While amalgamation with the B. C. Copper seems imminent, John Seward has arrived on the ground from New York to take charge. Mr. Seward will first make a thorough examination of the company's property and decide what will be the best policy to pursue. One certain thing is that the management will have to put forth its best efforts to place the property on a profitable footing, especially if it be the intention to do its own smelting. There is a good deal to do in the way of development in the mines if what has already been given out be true, and there is room for great improvement in the ore-handling facilities at the mines, while the smelter as it stands at present presents a problem in itself. It is understood, however, that the General Development Co., of New York, is backing this venture strongly, and there is no doubt that with a good sum of money intelligently and judiciously expended the Dominion property can be made to pay as well as any of the other low-grade Boundary mines. Business is gradually getting under way at the B. C. Copper property. Last week two of the furnaces were started.

The Jackpot mine, recently acquired by this concern in Wellington camp, is showing up in such a satisfactory manner that the adjoining property, the Oxley, has been acquired at a price of \$5000. The Canadian Consolidated has, in the course of its expansive policy, taken a bond on the Black Jack claim in Central camp. Seven carloads of ore were shipped from the Bruce mine, near Midway, last week. The Bruce is proving excellent.

There is a probability of the Jumbo gold mine in the Rossland district being re-opened again. A large quantity of rich ore has been taken out for the amount of development

that has been done. On the Enterprise claim, Norway mountain, a good discovery of free-milling gold ore has been made. A small shipment of sacked ore is being made to the Trail smelter. At the Fife mines a good body of copper ore has been opened in the 'glory-hole', that will assay from \$13 to \$30 per ton. Several carloads will be shipped soon, as the road to the siding has been finished. The shipments from the Centre Star group and the Le Roi No. 2, Ltd., are up to the average. The shaft on the Le Roi No. 2, Ltd., has been sunk to 140 ft. below the 900-ft. level and is still going downward. The ore shipments from the North Star mine in the Nelson district have been climbing for the last several weeks. The Ottawa mine also appears on the list, with a shipment of silver ore. The Second Chance and the Juno claims at Erie have been leased by a local syndicate. Work on the Highland-Buckeye group, near Ainsworth, has reached a point where shipments are about to begin. There is a lot of crude ore now on hand that will assay 60 to 70% lead and 25 to 30 oz. silver. The shipments will be made to the Trail smelter. The Highland mine in 1903 was the largest shipper in this district, the St. Eugene surpassing its output the year following. Since the mine was re-opened several weeks ago a new rich orebody has been uncovered. The coal miners of the Crows Nest coal mining region, or part of them, are forming a Canadian Mine Workers' Union, feeling dissatisfied with the manner in which the local officers of the American union handled the last two strikes; in fact, precipitating the strikes in some cases contrary to vote.

BUTTE, MONTANA.

Electric Power.—Influence on Costs. — Clark Properties. — Davis-Daly.—Tuolumne.—Ohio Keating.—British Butte Dredge.

The introduction of electric power at the Butte mines, to replace steam power, will reduce the cost of production about one-third of a cent per pound, and it will reduce Amalgamated costs considerably below 10c. per pound. A still greater saving will be made at some of the Amalgamated mines when the new Belmont shaft is completed. The Belmont shaft is nearly two miles south of the shafts of the Anaconda, Neveweat, and St. Lawrence mines of the Anaconda company. At present fuel and supplies have to be hauled up hill several miles by steam, and then all the ore must be hauled down again after it has been trammed underground for a mile or two to the hill shafts. A new shaft is also being sunk at the Gagnon mine, an Amalgamated property, and that will serve to make a large saving in operating expenses.

The North Butte, in six months, will have two working shafts in place of one. The North Butte is turning out copper at 8c. or less per pound. Some of the Amalgamated mines are producing copper at 9c., but at several the cost is as high as 13c. The Anaconda group runs between 9 and 10c. Butte Coalition copper, it is estimated, costs about 9½c. The latter company has been under extraordinary expense in development work ever since its organization, in spite of which the cost of production has been gradually reduced. Among the high-cost producers are the Pittsburgh & Montana and the Original Mining Co., the latter owned by W. A. Clark. The public is not much interested in the Clark mines, as they have few stockholders outside of the Clark family. However, it was stated sometime ago, that during the panic the Clark mines were operated at a considerable loss and that it cost 13c. per pound to produce copper from the ores of the Stewart and Original mines. Reports from the Davis-Daly mine are that a big producing property is being opened. In the face of this, however, some of the insiders in Butte, and employees of the company, have been selling the stock lately, a fact that has discouraged outsiders from investing.

The Tuolumne Mining Co., which has a number of stockholders in the East, and also in California, appears to have made a genuine strike on the 1400-ft. level of the Tuolumne mine. The vein, which is believed to be an extension of the Edith May of the North Butte Co., is about 20 ft. wide in the cross-cut, and 11 ft. of it is high grade, assays going as high as 20 to 35% copper. The rest of the vein yields

good concentrating ore. Driving has been started on the vein both east and west. The top of this orebody seems to have been cut on the 1000-ft. level, and is therefore believed to be continuous from that level down below the 1400. The plant, equipped with a Nordberg engine, has a capacity to work to a depth of 3000 ft. The boiler plant of 900 hp. was also installed recently. The shaft has three compartments.

The Ohio-Keating Gold Mining Co., in which a number of New York and Boston capitalists are interested, has made a considerable strike in its property in the Radersburg district, at a depth of 125 ft., where a drift has been extended along the vein. A big body of ore is being developed, and numerous assays show nothing less than \$12 per ton, and many are as high as \$78. Another body of ore was cut in the bottom of the sump of the shaft, 4 ft. wide, and yielding a general average assay of \$51 per ton. The claims of the company are on a vein parallel to the famous old Keating, which produced millions of dollars years ago. It is estimated that within 90 days the property will produce 90 tons of ore per day, netting at least \$20, or \$1000 per day. The company is a Montana corporation, capitalized for 500,000 shares, having a par value of \$1 per share. R. M. Calkins, traffic manager of the Chicago, Milwaukee & Puget Sound railway, is president of the company. The property is equipped with a gasoline hoist, a compressor, machine-drills, and pump, all driven with gasoline power.

The British Butte Mining Co., operating a gold dredge four miles west of Butte, has begun making regular weekly shipments of gold bullion. Last week's clean-up was 93 oz., which netted the company \$1313. It is estimated that this week's clean-up will be at least 50% more. The company has an operating expense of about \$600 per week. The capitalization is \$5,000,000. British Butte owns more than a thousand acres of placer ground. Bedrock is supposed to be nearly 2000 ft. below the surface, as demonstrated by a deep shaft and borings from the bottom. The placer is supposed to cover an old lake bed that drained the surrounding country for ages. There is a false bedrock only a few feet below the surface, and the dredge is working to that depth.

BISBEE, ARIZONA.

Mineral Production.—Tax Rate.—Copper Queen.—Drainage Troubles.—C. & A.—Irish May Shaft.—Precipitation Tank.

The Territorial Auditor, Mr. Foster, has completed the report of the 1908 bullion production of the larger mines in Arizona. The mines reporting are 51 in number, with a total output valued at \$42,249,281. In the previous year 79 mines reported an output above \$5000 each, totaling \$54,788,564. This drop of \$12,500,000 is mainly due to the decline in the value of copper, which had fallen off to little more than half the extreme price reached the previous year. This is shown by the fact that its copper production of the greater mines was larger, having been 291,584,080 lb. compared with 252,784,700 for the year 1907. The silver product reported was 257,697 oz.; gold, 136,059 oz.; lead, 2,995,183 lb., and zinc, 2,457,099 lb. The silver product from practically the same list of mines for 1907 was 2,423,723 oz., and of gold 118,373 oz. The largest gold production came from the United Verde copper mine, at Jerome, being 20,334 oz. Other large producers were the King of Arizona, 11,319 oz.; Congress, 8865; Tom Reed, 8512; Copper Queen, 8352; and Calumet & Arizona, 7628 oz. Copper mines were in the lead also in silver production. The Copper Queen reports 530,490 oz.; United Verde, 494,574; Commonwealth, 416,941; Tombstone Con., 299,597; Superior & Pittsburgh, 182,773; Calumet & Arizona, 155,802; Imperial, 96,614. The Tombstone Con. was the leader in lead, with 1,721,974 lb., together with 231,031 lb. of zinc. The largest zinc product came from the Union Basin Co.'s mines in Mohave county, being 631,588 lb. These reports were gathered and compiled for the purpose of establishing the tax-rate for each mining company on a basis of 25% of the value of the bullion product, this 25% being taken as the value for taxation. Mines producing less than \$5000 per year are taxed under the general law.

Both the Copper Queen and the Calumet & Arizona properties will evidently produce more copper this month than in July, but the Copper Queen will not produce at the same rate as during last winter and spring. This company has been greatly impeded by water, at one time the capacity of the pumps at the Czar shaft being taxed to the utmost, both the steam and electric pumps working at maximum capacity. The old steam pumps were not removed when the electric equipment was installed, and they have proved a most necessary auxiliary under the recent emergencies. Exploration is progressing actively in the lower level, but no important discoveries have been made of late. Driving in the Lowell shaft is now going on at the 1400-ft. level and the connection with the Sacramento will be made in the 1300-ft. winze shortly. At Courtland this company is installing, in union with the Great Western, a community-power house, and development is progressing rapidly. Favorable results have attended the development on the 1400-ft. level of the Superior & Pittsburg, in the sulphide zone. The production from this property will re-



Map of Arizona.

main on practically the same level as in July. In the Hoatson shaft of the C. & A., a body of oxide ore has been developed on the 1300-ft. level, and it is considered of importance because it is the farthest south that any ore has been proved in this district. New machinery is on the ground at the Irish Mag shaft. This includes a new electric hoist and 5000 ft. of cable, and accessory equipment. The shaft will be retimbered at once. Hoisting with the improved shaft and new installation will begin about September 1.

The new precipitating plant at the Copper Queen which is being erected to replace the one which collapsed some three weeks ago, is now nearing completion. The three weeks loss of the copper impregnated water has amounted to a neat sum, but the work of reconstruction has gone forward without delay. The precipitating plant receives the copper-impregnated waters from the mine which are caused to flow over old tin cans and scrap-iron. In the rainy season the saving by this method is a not unimportant matter. The old plant collapsed by reason of the copper sulphate solution eating the nails with which the structure was joined. In the new plant this has been avoided by using wooden pegs in place of nails.

Work on the Bernoudy-Turkey Creek property is being pushed actively, and on September 1 a large force of miners will be added.

MEXICO.

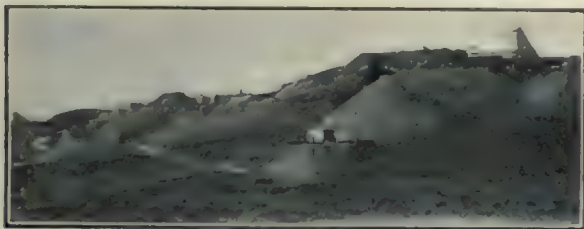
Alvarado Consolidated Mines Co.—San Francisco del Oro.—Cuadras Mine.—El Carmen, Inde, Durango.—Manta Mining Co.—Promoter Arrested.

The spirit of the clause No. 44 in last year's draft for a mining law, which was withdrawn, has cropped up in a new way. Formerly when concessions were granted, the possessive clause read: "that the concession was granted to the individual named or to the company which he might organize." It is to be noted that nearly all of the concessions now granted, and published in the *Diario Oficial* have the possessive clause worded: "*para por si ó por medio de la compañía Mexicana que al efecto organice, conforme á las leyes de la República,*" etc., which translated means that the concession is granted for the individual use of the concessionaire or the Mexican company which may be organized for the purpose, in accord with the laws of the Republic. There is also a clause which expressly stipulates that the concession cannot be passed to a foreign corporation for any motive whatsoever. A letter was recently sent by the Secretary of the Treasury, José Yves Limantour, to the Board of Directors of the National Railroads, requesting that natives be given the preference in promotion and employment whenever possible, and also criticizing the Board for not having Mexicanized the great body of railroad employees more rapidly. This letter has been the subject of much comment. A great many foreigners have taken it as indicating a willingness on the part of the Government to pander to the anti-foreign agitation which exists in certain sections. A meeting of protest was organized in the American colony in Mexico City to see what could be done to prevent the publication of so much exaggeration and misstatement by the United States daily press about Mexican affairs. In Chihuahua a current of quiet negotiation runs throughout the State, but matters were particularly awakened by the long-time lease on the Palmillo, of Pedro Alvarado, in Parral. Even this, however, was rather hawked around for a considerable period, not because it lacked value, but more because of its magnitude, until finally the present holders, A. J. McQuatters and James I. Long, obtained control. They first took it over on a leasehold, organized a \$5,000,000 company, and started unwatering. This gave them plenty of opportunity to thoroughly examine the property, and it was not long before they made a deal with Alvarado for the purchase of the property at \$1,000,000. The company was at once re-organized under the name of the Alvarado Consolidated Mines Co., with a \$10,000,000 capital. Of this a goodly portion has been sold to obtain working capital, and for the erection of a 1000-ton mill. The milling company will be in a sense separate, as the Palmillo Milling Co., of \$1,000,000 capital, is a subsidiary of the mining company, and the mill will be erected, as production demands, in units of 250 tons each. It will be of the fine-concentration type, followed by cyanidation, and will do a custom business as well. It is stated that there are 300,000 tons of \$10 ore blocked in the upper levels of the mine, and that there are 200,000 tons of a similar grade on the dumps; that this ore can be treated at \$3 per ton, leaving a profit of \$7 per ton, or a total of \$3,500,000, more than three times the cost of the mine. This looks well, but there does not seem to have been taken into account the cost of mining, which certainly could not have been included in the \$3, for in a camp where all kinds of supplies are high, where labor is no longer cheap, and at a mine where they will be required to pump continually from 1200 to 1500 gal. per minute from a considerable depth, the cost of mining is no small item. That the Palmillo is a good mine and will pay well, there is no doubt, but the enormous capitalization of the new company gives it rather a bad flavor. With the resuscitation of the Palmillo comes also that of the San Francisco del Oro, lying between Parral and Santa Barbara, not only by a practical re-organization of the old company (in the form of a rather stiff assessment), but a change of management. This property has what is undoubtedly one of the largest deposits of complex sulphides in Mexico, and under the management of J. E. Hyslop, the English company spent several hundred thousand pounds with no re-

turns, experimenting with simple concentration, oil separation, the Sutton-Steele, and others, without success, until the company's money was exhausted. A thorough re-examination of the mine was made, and the mine was reported upon favorably; additional funds were raised, but a new management was called for, and the property has now been placed in the hands of William S. Harrison. As yet little is being done, but a careful study is being made of the problem, and it is thought that success may crown this new effort. Adjoining the San Francisco del Oro, the Cuadras mine, owned by the Marina Mines of Mexico, Ltd., and held under lease and bond for £20,000 by Charles M. Hobson, has been taken over by the Torreón Metallurgical Co., and 25 tons per day are being shipped to the latter's plant at Torreón.

Frank Husted, of Parral, has organized a new company, with American capital, to take all the properties held by him and Messrs. Iwansky and Hemminghoffen at Indé, Durango, and some gold properties held by Mr. Husted in the El Carmen district. New and larger shafts will be put in where needed; air-drills will be introduced at El Carmen; and a cyanide plant will be erected for the ores from the Santa Lucía, Santa Eduwigs, and the Campana. The shipping ores have been contracted for with the American Smelting & Refining Co. At the new concentrating mill of the American Zinc Extraction Co., at Parral, three Huntington mills have been added for finer grinding.

J. E. Hyslop, former manager for the San Francisco del Oro, with Walter MacLachlin, a director of the said company, and Mr. Holms, formerly with the Palmarejo and



Palmillo, Parral.

Mexican Gold Fields, Ltd., have organized in London the Manta Mining Co., with £100,000 capital, for taking over 19½ pertenencias in the Santa Eulalia district, near Chihuahua, known as the Carmen-Negrita group, and situated near the rich Mina Vieja of the American Smelting & Refining Co. Mr. Hyslop and associates are said to have £25,000 working capital, and work has already been started. It is believed that good returns may soon be expected from this new enterprise. Some work had already been done on the Carmen, and it was known to have good ore, though no large body has been proved.

Pedro Noriega Ruiz, promoter of the Gallega and Cuatro Señores mines, against whom an accusation of fraud was pending, was arrested day before yesterday in Vera Cruz, and has been consigned to Belén to await trial. Noriega, it is alleged, promoted a company to develop the two mines which are situated at Zacualpán in the State of Mexico, and sold shares to the extent of more than \$30,000 to mining brokers in Mexico City. It is claimed that he collected the value of the shares from his purchasers, giving in return receipts, and promising to deliver the certificates of stock as soon as his title to the properties should be perfected by the Department of Fomento. It is said that Noriega left in August of 1907, and has never been heard of since. Upon his disappearance, a group of his creditors, headed by Juan Roustand and Lic. Eusebio E. Miranda, notified the Department of Fomento of the matter, asking that the deeds to the properties be not delivered to Noriega. At the same time a formal accusation was made against the promoter, and the matter was put in the hands of the police. Hearing from its agents in Vera Cruz that Noriega had been seen in that city, the chief of the secret service, Francisco Chávez, ordered his arrest. Noriega disclaims fraudulent intentions or acts. He denied having received money from Roustand, and said that he could prove that all his transaction in Mexico have been upright.

SALT LAKE, UTAH.

Cole-Ryan After Lead Mines.—Ray Con. & Gila Will Produce Heavily.—United States Copper Furnaces.

Repeated efforts have been made to form a merger of mining properties in Park City. At first the Bamberger interests attempted to get the Ontario, Daly, and Daly-West properties to unite. It was also intended to take in the Little Bell, Thompson, and several adjoining properties in which the Bamberger syndicate had an interest. The Eastern interests in the Daly-West balked at this, and for a time an effort was made to get the control of that mine from the Bambergers. Recently a successful termination of the efforts at a coalition of the West Quincy and Thompson properties has been brought about, and in the meantime the controlling interests in Daly-Judge are continuing their warfare on the Bamberger interests and hope to be able to wrest the control from them at the next annual meeting of the shareholders. An effort has been made to get the Silver King Coalition Mines Co., the only regular dividend-payer of Park City, into this consolidation. By getting the Silver King in the deal it was hoped to also include the Daly-Judge, so that one company might have all the producing ground in that great silver-lead district which has produced more than \$100,000,000 worth of ore and has paid half this amount in dividends to its shareholders. As the Silver King was much more valuable than all of the other properties, and as its owners could see no advantage in a consolidation, the scheme failed. Recently the Cole-Ryan people have been endeavoring to get control of the silver-lead product for their new smelting plant in Pine canyon. They have held conferences with the owners of these properties, and while nothing has been arrived at, it is learned that they hope to corral these producers and thereby get control of the output of the principal silver and lead properties in Utah. As a first step in this direction they have made overtures to F. Augustus Heinze for his 10-year contract for smelting the Silver King ores. They have not come to terms as yet because the Silver King will not agree to a transfer unless the terms of the smelting contract are modified. This has decided the Cole-Ryan agents to continue the original effort for buying the properties outright, and this move is being watched with much interest, as such a purchase would involve many millions of dollars.

Daniel C. Jackling says that Ray Consolidated and the Gila copper properties will be in position to begin regular production of ore within one year. The new milling plant, having a capacity of 5000 to 6000 tons per day, will be completed by that time, and the Ray now has 50,000,000 tons of 2½% copper ore proved. The Gila is developing at a rapid rate, and its ores will be treated by the mill on the Ray property. Actual construction will begin on September 15, while the steel material will begin to arrive on September 1. The Gila will have about half as much mineral territory as the Ray. There is a community of interest in these properties, and they will be worked almost on the same plan.

George W. Heintz, general manager for the United States Smelting, Refining & Mining Co., says that they have a great deal of the work completed on the new copper furnaces. They are taking some of the material from the old Bingham Consolidated smelter, which was closed by order of the Court on January 1907. Both the Bingham and Utah Consolidated plants are being dismantled, the International Smelting Co. taking the equipment and some of the material from the Utah smelter. The bag-house will be the last portion of the copper plant to be completed for the United States company. It is expected to have some of the copper furnaces running not later than next January, and from that date the company will be in the market for copper ores. With the Garfield, United States, and International Smelting plants in the field for copper ores, the competition promises to be keen and to make this one of the greatest smelting points in the world. The three plants will have a combined daily capacity of 8000 tons of ore.

The Crowther leasing company at Park City is shipping \$15,000 worth of ore per month to the smelters. The company has also erected a small mill making four tons of concentrate per diem.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Flashing point is the term applied to the particular temperature for any volatile combustible substance at which it gives off an ignitable vapor.

Impact pulverizers have an important application in certain classes of crushing for concentration, especially where the ore contains much pyrite. The Sturtevant, Williams, Raymond, and Cyclone are all impact machines.

Mundic is a Cornish term applied to pyrites, either ordinary iron pyrite or marcasite. When arsenopyrite is present it is called arsenical mundic. The term is used considerably in Canada, but not to any great extent in the United States.

Diamond-drill holes invariably depart from a straight line, and need to be surveyed, special apparatus being purchasable for that purpose. Contrary to what might be expected, horizontal holes deviate less from a right line than those inclined toward the vertical.

Hot-blast yields no important advantage in pyrite smelting, and the efforts to utilize it have been abandoned, together with the attempt to smelt pyritically, without coke. At present so-called pyritic smelting is effected with the use of from 1 to 3% of coke.

Juvenile waters are those which issue from deep-seated magmas, and hence constitute a new addition to the waters on the surface of the earth. They are generally highly charged with mineral matter, and are carriers of metals. A large number of veins are formed by the action of juvenile or magmatic waters.

Strength of materials is decreased by fatigue. Constant application of a relatively small stress will produce a rupture in a material having theoretically a resistance exceeding the amount so applied. This is called 'fatigue of material'. Fatigue is more marked if the stress alternate from tension to compression and back again.

Lime in solution is present as the bi-carbonate, $\text{CaH}_2\text{C}_2\text{O}_6$. On the breaking up of the bi-carbonic ion, HCO_3 , carbon dioxide, is given off, and the normal calcium carbonate is formed. As this is insoluble it precipitates. In this manner deposits of calcareous sinter, onyx marble, and cave-marble are produced.

Gold mining costs have probably reached a lower limit at the Alaska Treadwell property on Douglas Island, Alaska, than at any other mine in the world. The total cost of mining and milling is \$1.40 per ton, the average yield from the ore being \$2.18 per ton. The treatment consists of amalgamation and concentration. There are two mills of 240 and 300 stamps, crushing respectively 4.51 and 5.5 tons per stamp.

The cost of milling is about 18c. per ton. The deepest level of the mine is 1450, the bulk of the output coming from the levels between 600 and 1050 feet.

When a force is applied to a piece of material the stress is not instantaneously produced, but moves with a wave-motion through the mass. The velocity of this motion can be found, and it is shown to depend upon the stiffness and density of the material. The velocity of stress should be taken into account in problems involving impact and suddenly applied loads.

Alkali-waste from the ammonia-process for making carbonate of soda contains chiefly lime carbonate in a soft state resulting from precipitation. There is also present some lime hydrate. When the amount of magnesia is low it makes an acceptable material for the manufacture of portland cement. The cement from this material is made by the 'slurry' or wet-process.

Mining claims duly located, and held by performance of all the legal requirements, carry with them absolute control of the surface right, inclusive of the products of the soil; but an owner of a claim, or one holding a claim by performance of assessment work, has no cause for action at law because of destruction of any crops growing thereon, due to stray cattle, unless the claim be properly fenced.

Arsenic and antimony are associated with most silver ores, and occur down to great depths at Kongsberg, Norway, at Guanajuato, Mexico, and elsewhere. There seems to be no limit in depth for the formation of arsenical and antimonial minerals so far as exploration has yet gone, but in a general way it may be said that the richer deposits have been discovered at no great depth below the present surface.

Eight men locate and stake a valid association placer claim in March 1896; in April 1906, seven of the original locators quit-claim to the eighth, who duly files deed for record; in February 1907, one of the original locators dies; during this year \$100 worth of work is performed; during 1908 \$600 worth of work is done, and the deputy mineral surveyor runs out the lines of the original location and shows this claim to overlap adjacent patented ground. There being unlimited vacant ground suitable for the purpose, and it being imperative to command the entire 160 acres for drainage purposes, the question arises, how can one individual (the deed-holder) amend or re-locate so as to exclude the overlap and include an equal amount of new ground in a manner acceptable to the land-office, being a 160-acre claim. Excepting only the locator who died, the deed-holder is in touch with all the original locators, and if that would cure it he could quit-claim back to them all, except the one who has died. The law does not require that the 160 acres shall constitute one square quarter of a section; the grouping of the eight claims in one association claim may be according to the desires of the locators. The legal difficulty might be overcome by introducing an eighth party in a re-location and obtain the requisite quit-claims.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

A Russian Money Trust.

The Editor:

Sir—I am astonished that such an article as the one headed 'A Russian Money Trust', should have found its way into the columns of your issue of August 7. Such a mass of nonsense and falsehood is seldom found in two and a half columns of printed matter, and its facts and conclusions sound much like those of some of the rabid free-silver orators of Mr. Bryan's first campaign. It is evident that Mr. Walsh, whoever he may be, is entirely ignorant of the mining of platinum in the Ural region; and having certain theories about money-trusts and governments, manufactures his facts *ad libitum* to support his contentions. It seems to be his desire to prove that the Russian Government has manipulated a platinum 'corner' after the approved methods of the operators in the Chicago wheat-pit, and that by backing a "small coterie of mine owners," by coining and withdrawing from coinage, and other schemes, has fixed the price at will to suit its own purposes. What utter rot! The platinum industry is of great interest to the whole world in view of the numerous uses to which the metal is now put, and the false impressions created by such an article as the one in question, certainly ought to be corrected by a statement of the facts.

An examination of the first paragraph fails to disclose a single statement that is not false. "A small coterie of mine owners, backed by the Russian Government, has enjoyed for years one of the closest monopolies of the world." Does not this sound like populistic twaddle? The fact is, the land in the platinum-producing regions has been classed in two categories, that held in large landed estates, and Government land, open to mineral location. The former was granted in large tracts at an early date in connection with the opening up of the country, and more especially for the development of the Ural iron industry, which Russia found so necessary for ordnance in the seventeenth century. The latter has nearly all been taken up in mining claims under the liberal Russian mining law. In neither does the Government concern itself today further than to encourage the mineral production and collect the small tax levied on the output. In this connection Mr. Walsh would be interested to read the proceedings of the conventions of the Association of Gold and Platinum Miners of Russia.

Platinum in the Urals always occurs in connection with gold in the placers, and in the earlier days was of course regarded as a drawback. Early in the nineteenth century Government ownership and operation of gold mines in the Ural region was discontinued, and private enterprise was given a chance. With this came an increasing production of platinum, a metal for which at that time there was little mar-

ket. Intrinsically there was no reason why it should not be used the same as gold, and Russia, rather at a disadvantage with other European countries in respect to metallic currency, was easily persuaded in 1826 to begin the coinage of a limited amount of platinum. This was continued at intervals until 1864. The reason why this did not prove successful, and why the Government ceased coining platinum, does not require the ingenious explanation given in Mr. Walsh's fourth paragraph. It is perfectly evident to anyone who has studied the subject of money. The fact was that it was impossible to keep in circulation a metal the value of which was continually fluctuating and with a ratio to gold that was always changing.

Then Mr. Walsh goes on to tell of the Government's attempt to recall the platinum money and how this was found to be impossible because the peasants had hoarded it. More absurdities! The platinum coins never had a wide circulation, and the only effort the Government ever made to recall them was to offer to redeem them when their coinage was discontinued. Some were offered for redemption, but a large proportion was preserved as curiosities, and even before the recent remarkable rise in the value of platinum, they were held at a good premium. I remember in the early nineties seeing them brought out in country homes and displayed as rarities. "Over a half million dollars' worth of the coins is hidden away, and only occasionally small quantities leak out and find their way to the Government Mint." I venture to say that the amount of platinum coins owned by collectors is very much more than this, and when any of them are melted up it is not by the mint, but by the jewelers. The introduction of platinum diamond-settings and other platinum jewelry by Fabergé, the famous jeweler of St. Petersburg, was a noteworthy achievement.

To return now to the first paragraph. The Russians are notoriously lacking in industrial enterprise, and practically throughout the nineteenth century the platinum industry underwent little or no change. The right to locate mining claims was gradually extended to include a larger number of people, and the discovery and opening up of new placers went on slowly. Of all the Ural gold region, the rivers richest in their proportion of platinum were the Iss and the Tura, and as the demand for platinum began to increase, more attention began to be paid to this field. There is no such place in the Ural as the "mining settlement of Miac," which Mr. Walsh mentions; it is possible that he has thus incorrectly translated 'Miass', the centre of a large gold mining region, far removed, however, from the platinum district. It was not the Russian Government, but French capitalists who first saw the industrial opportunities offered by the platinum placers, in view of the rise in price, and the limited supply. A syndicate was quietly formed in Paris, of French capitalists, and as many as possible of the mining claims along the two rivers above mentioned were purchased. It was not long before the public awoke to the fact that the platinum market was cornered, and the price was gradually raised to more than that of gold.

The worst of it is that there has never been a time

since the formation of the French syndicate that it has not been possible to obtain plenty of platinum-bearing ground in the Urals outside of what they own. Americans, who are usually enterprising in seeking new mining fields, especially where clever methods of working will mean increased profits, have neglected this region and have allowed the French to keep their monopoly. For a number of years the large private estates in the Urals were in the market, but American mining men paid no attention to them. Later the French company contracted for the whole output of most of these estates at a price that averaged about \$13 per ounce, in order to forestall competition. Even at the present time there are many good properties to be had; not for nothing, however, but at a fair price; and these would yield an excellent return with good management and improved methods. Some of the lower reaches of the platinum-bearing streams are being worked by means of small dredges. The present practice in this work is crude, and here is offered a fine opportunity for American enterprise. Several of the large land-owners of the Ural have untouched platinum ground that sooner or later can be purchased, and those who have already contracted their product for a period of years, will soon be in the market again. Russian geologists have recorded several instances of finding platinum in the rock, but thus far no body of platinum-bearing ore has been discovered. It is quite possible that such a body may be found some day, and then the shares of the French platinum trust will take a bad drop.

In conclusion, let me quote two sentences from Mr. Walsh's article. Compare the statements contained in the two. "Many times in the past Russia has used this absolute monopoly to pay her debts, and after the close of her war with Japan she increased the price of platinum to help her recuperate." "The total annual product of the platinum deposits of the Ural Mountains does not exceed in value \$2,000,000." Further comment would appear to be superfluous.

JEROME B. LANDFIELD.

Binghamton, New York, August 12.

Churn-Drill Gravel-Sampling.

The Editor:

Sir—In your issue of March 6 I note an article on 'Churn-Drill Sampling', by W. E. Thorne, and I notice in this article that he confines his attention entirely to the drilling accompanied by driving the casing to bedrock. I wish to call your attention to my experience with a churn-drill method that avoids many pit-falls described by Mr. Thorne. The method that I have used is one that sinks the pipe to bedrock with little or no driving, and as a result I am convinced that it secures more reliable samples. The object of drilling placer-ground is to get a sample which is a cylinder of material of a certain diameter. In either case a pipe is sunk to bedrock, and the material enclosed by the casing is recovered and its actual gold content extracted.

There are two methods of sinking casing used today; one wherein the pipe is driven, and the other where it is sunk by weight, aided by rotation. There are numerous objections to the driving method.

These were well recited by W. E. Thorne in his article, as follows: "The material that belongs to the core is driven aside. The core may be compacted by driving, and if a considerable difference in the water-level between the inside and outside of the pipe occurs, and the core is suddenly loosened, material then runs into the pipe and gives false results. Flat rocks may be encountered, as described in this article, and driven aside. Intermittent pumping with a large pump results in a sudden lowering of the water-level inside the casing, and then the sudden inflow from the outside carries material with it that properly does not belong to the core."

I have used several types of hand-prospecting drills, one of which uses rotation and weight as a means of sinking the pipe. This is known as the 'Empire' method. The casing is constantly rotated by hand or by animal power. It has a sharp-toothed cutting-shoe on the bottom. The platform is attached to the top, and on it three or four men stand, who do the churn-drilling, using a tool which is a drill and pump combined. The weight of the casing, of the platform, of the men who stand on it, and of the drill-rods and tools, aggregates nearly one ton. This weight sinks the casing owing to the fact that it is kept always loose by being rotated. The cutting-shoe penetrates the gravel and cuts a clean core, and as this core works up into the pipe it is further drilled and picked up at once by a drill-pump. This is a regular sand-pump with a ball-valve, having a circular, hollow drilling-bit attached to its lower end. With this combination-pump the core is pumped as fast as it is drilled. It is seldom necessary to drive the casing, and when it must be done a small amount only is needed, for the pipe, always being rotated, is always loose and sinks easily under the weight of men and platform, as above explained.

The disadvantages mentioned by Mr. Thorne are obviated in this method, and a truly representative sample is had. The drill is really a combination core and churn-drill, and its action is to cut a core like a core-drill. This is done by a sharp-toothed cutting-shoe of nickel-steel which is attached to the lower end of the casing. The casing is revolved by horse or man-power, and the cutting-shoe acts like a 'Calyx' drill in cutting and loosening the core.

The pump with its drilling-bit cannot be operated below the casing, owing to the fact that a safety-clamp prevents, therefore many of the difficulties resulting from drilling below the casing in steam-drilling are obviated. If a boulder be encountered and it becomes necessary to drill below the casing, then the tools are changed and a regular rock-drilling bit is substituted for the drilling-pump, and the boulder is drilled through or shattered by the combined action of the drilling and the driving of the casing. In steam-drill practice a vacuum-pump of large capacity is used at intermittent periods and the large volume of water suddenly removed from the inside of the casing causes a great in-rush from the outside, whereas with the 'Empire' method the pumping and removal of the core are continuous.

In steam-drilling a foot or more is drilled at a time with a heavy drilling-bit and the material is drilled so fine that it results in sliming the core and

the mineral content, thus causing consequent losses. With the 'Empire' method the core is drilled and pumped as soon as it enters the casing, and gravel under an inch in diameter is often picked up in the pump without being drilled at all, and the core is not slimed or pulverized by excessive drilling, as so often happens with the steam-drill. With the steam-drill the cutting-shoe has very thick tapering or wedge-shaped walls, as it must stand the force of the large driving-effort, and these thick wedge-shaped walls tend to crowd material inside or outside and cause an inaccurate core. A thin shoe, however, with straight walls, in rotating, instead of driving, cuts a clean core of a constant diameter.

When operating in loose ground, sinking the casing by rotation and pressure or weight prevents the loose ground from running into the pipe. The casing is always loose on being rotated, and immediately sinks through any soft spot that may be encountered, thus maintaining an accurate core. In steam-drilling it may happen that the drill breaks through from hard ground to soft, and drilling proceeds below the casing, in which case the loose outside ground runs into the casing and gives inaccurate results, removing many objections stated by Mr. Thorne.

Mr. Thorne cites several discrepancies between the results of churn-drill prospecting and dredging, and many more can be shown where casing was sunk by driving. An admirable book on 'Dredging for Gold in California', by D'Arcy Weatherbe, cites wide discrepancies between the results of churn-drilling with driven casing, and subsequent dredging-results, some of these running over 200%. It is of more than passing interest to note an instance where ground was drilled with a churn-drill with rotated casing and each clean-up of the dredge compared with the value as shown by the drill-holes dredged out during the previous run. The extremes were as follows: drilling was to dredging as 96.6 is to 100 and as 103 is to 100. When results for a considerable time were averaged, it was found that the drilling and dredging results practically coincided.

Many other discrepancies are encountered in driving casing not mentioned by Mr. Thorne, such as injury to the casing and the difficulty encountered in pulling it. If the casing be rotated during its entire period of sinking, it is always loose and there is no trouble whatever in pulling it. This is an important feature. It often occurs that a string of driven-casing is lost by the joints pulling apart while the casing is being pulled. I maintain that drilling, when carried on with churn-drills, using rotated casing, is more accurate, and its results more reliable than can possibly be had where shafts are sunk in wet ground or below the water-level of a placer. Shaft-sinking in wet ground is costly and often impossible without large pumps, and results obtained under such conditions are absolutely unreliable on account of the material running in from the outside with the flow of water. The conditions that interfere so seriously with shaft-sinking have no ill effect upon drilling with the rotated casing method. It is worth noting that it is not possible to sink shafts in beds of streams without caissons and compressed air. The hand-drill, with rotated casing, works un-

der such conditions with great ease while floated on a small scow or a few canoes.

J. P. KEENE.

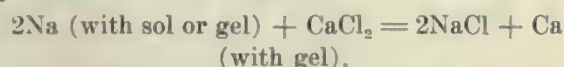
Woodland, California, August 10.

Slime.

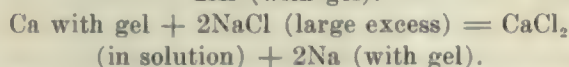
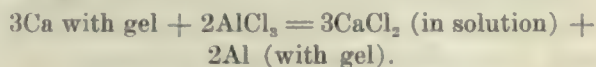
The Editor:

Sir—Following the discussion of slime in the MINING AND SCIENTIFIC PRESS, I would say that all non-crystalline (solid) and non-crystalloid (liquid) matter can be called colloidal. If suspended in a liquid, it is a sol; if coagulated, it is a gel. The latter (which a few writers unfortunately call a pectoid) can be stained by dyes. I have used malachite-green oxalate largely. The action of a dye (color base + acid radical) in staining clay is strictly analogous to that of CaCl_2 ; both may be adsorbed and displaced.

The clay gels have the property of adsorbing or taking up basic atoms from solution. This is usually an exchange. Thus the action of calcium chloride may be illustrated as follows:



The Ca can be recovered from the gel by displacing it with an excess of another salt, namely:



Precious metals in true solution would act like Ca in the equations above.

Fine grinding, by increasing the amount of colloid matter would in that respect tend toward the retention of bi and tri-valent metals; unless these metals are displaced by excess of some cheap soluble salt.

When a solution is in such condition that colloidal matter if present would tend to assume the sol form, the fall of all particles will be retarded. This is when either or both the hydroxyl ion concentration is high and the viscosity is high. But the presence of the colloids is not essential, although they, like soluble salts, may be accessory to such changes in the rate of subsidence.

HARRISON EVERETT ASHLEY.

Newell, West Virginia, August 7.

Asbestine.

The Editor:

Sir—I notice on page 181 of your issue of August 7 that under the heading 'Asbestos', you refer to a product called 'asbestine', used as a pigment. The connection in which this fact is mentioned implies that asbestine is either a variety of asbestos or a product derived from asbestos mines. Such, however, is not the case; what is called asbestine in the trade is not asbestos, but a fibrous variety of talc. The mineralogical name of this talc is agalite, which is a pseudomorph after tremolite. This material is mined, and prepared for the market, at and near Gouverneur, New York, in the Adirondack mountains. There is no asbestos produced, nor has it ever been found there to my knowledge.

E. SCHAAF-REGELMAN.

New York City, August 13.

GEOLOGY OF NORTHERN MEXICO.

Written for the MINING AND SCIENTIFIC PRESS
By R. H. BURBOWS.

The mining districts adjacent to the line of the Kansas City, Mexico & Orient railway, taking in a strip about 70 miles in width by 400 in length, extend from Presidio del Norte on the Rio Grande, to Topolobampo on the Gulf of California. The territory in question may be most conveniently subdivided into three regions, namely, the Eastern, Sierra, and Western. These subdivisions may be fairly well defined. They differ from each other essentially in physiographic features, climate, geology, and character of mineral deposits. Beginning at the Gulf of California, the Western region may be considered to extend from the Coast to the western base of the Sierra Madre, a distance of about 150 kilometres (96 miles). Continuing eastward from this line, the Sierra region will be assumed to extend to the line of the Mexican Central railway. From this line, the Eastern region extends to the Rio Grande. The Eastern region, which is especially discussed in this paper, is characterized by an almost even distribution of mountain and plain, the mountains consisting of isolated peaks or ranges of small extent, while in the Sierra the mountains predominate, running in more or less extended ranges, until the continuous chain of the Sierra Madre is reached. The almost level surface of the Western region is interrupted only by the narrow range of hills that crosses the Fuerte river at San Blas, the plain being bounded on the west by the San Blas range that fronts the Gulf of California.

The general geology of the three regions is different. The Eastern region is mainly underlaid by sedimentary rocks. The Sierra province is almost entirely covered by late eruptives. The Western region differs from both in the constitution of its bedrock, which is principally granite, and older than the others. The difference in altitude, and the great difference in the quantity of rainfall in the three regions, gives each a different climate, causing an essentially different flora, with corresponding variety in agricultural conditions. The extensive plains of the Eastern province, with their deep, rich soil, are, through lack of moisture, of little utility except for grazing. On the contrary, through the constancy of the summer rains, and the persistence of the streams in the Sierra and Western regions, crops may be raised wherever sufficient soil can be found to cover the seed.

EASTERN REGION.

The general character of the Eastern region is that of regularly alternating mountain and plain, the latter remarkably level, with an average altitude of 4000 ft. above sea-level. The mountains rise abruptly to additional heights of 500 to 2500 ft. The region is traversed by the river Conchos, which, running at almost right angles to the mountain chains, has cut through some of them near their points of greatest elevation. The eccentric course of this river is a most striking phenomenon, and difficult to account for. Instead of choosing the easier

course through the plains, it has cut through the rocky strata of the ranges, at practically their central points. The proper course for the stream would seem to be a continuation of the San Pedro river near its junction with the Conchos. Following that course it would have passed to the south, avoiding the high ranges, finding an easy path across the north end of the Chilicote plain, and thence through the Puerto del Gato straight to the Rio Grande. Instead of that it goes out of its way to plunge into the heart of the mountains, preferring a tortuous course through a dark rocky enclosure, rather than the straight path through the open freedom of the plain. In passing through the mountain ranges, the river has carved deep canyons, impassable at many points, some of them not far inferior to the barrancas of the Sierra Madre in their abruptness. Entering the region from the southwest, the river turns around the Sierra San Diego, and running northward through the plain, for about 20 miles between two mountain ranges, makes a right angle to cut through the Sierra del Morrión. It then traverses another narrow plain, plunging again into the Sierra de Santo Domingo, from which it emerges into a long valley, in which are some of the most fertile lands of the region. After meandering through this valley the river cuts across the range at Las Vigas to enter the valley of San Pedro, leaving it through the San Pedro range to emerge into the valley of Cuchillo Parado. To escape from this valley, the river breaks directly through the high range of Cuchillo Parado in a series of picturesque canyons, from which it finally debouches into the valley of the Rio Grande. As a source of water supply in its lower reaches, the Conchos river is exceedingly erratic. With its headwaters reaching to the summit, and draining about 400 kilometres (250 miles) along the eastern slope of the Sierra Madre, it is influenced by the summer rains of the Sierra region, becoming a mighty river at times. During the dry season the irrigation ditches take practically all of the water except the underflow, so that it is possible to cross in many places dry shod. It is a great pity that the enormous quantities of water now going to waste in the rainy season cannot be deflected to the plains that lie on either side. These, if watered, would prove one of the great sources of wealth in the Republic.

A good idea of the topography of the Eastern region may be obtained by traveling eastward from the City of Chihuahua over the K. C. M. & O. railway. The manner in which the road winds around the bases of the mountain ranges, passing from one valley to another, demonstrates the interrupted character of the ranges and the way the plains are linked. Few of the ranges exceed 20 miles in length, their axes having a general northwest direction, corresponding to folds and faults that are probably contemporary with the elevation of the central plateau. The breaks in the continuity of the ranges are mostly due to variations in the intensity of the folding, and sometimes to faults, an example of the latter occurring at the break in the Sierra de Aldama, where the Chuvisear river enters the Aldama plain. That part of the range lying north of the river, has been

raised several thousand feet. The most extensive mountain chain is that of Cuchillo Parado, about 70 miles in length, forming in its continuity a notable exception to the other elevated portions of the region. Owing its origin to a great fold, which is traceable northwestward in somewhat interrupted series of ranges almost to El Paso, it determines in a great measure the course of the Rio Grande for a considerable distance, the river following approximately parallel to the axis of the fold.

By reason of the isolated character of the mountains, the plains run together at numerous points, forming continuous stretches of practically level ground. Good wagon roads are the rule, and the entire region is comparatively accessible. Although relatively narrow, some of the plains extend for im-

dise, before the advent of the railroads. It is still the highroad of communication that connects Ojinaga and other settlements of the Rio Grande with the interior of the Republic. As the distance between watering places is often 50 miles, this plain has claimed a number of victims. Heavily laden, slow-traveling wagons go provided with barrels, lashed one on each side, carrying two days' supply for man and beast.

Although the term 'desert' is frequently applied to these plains, conjuring up visions of the sandy Sahara, the only feature that renders them deserving of the epithet is the lack of water, there being no sandy wastes and few rocky barrens. Vegetation is by no means scanty, grass growing thickly all over the plains and mountains, with patches of mes-



La Boquilla, Conchos River, Chihuahua.

mense distances, demonstrating the great uniformity of the earth-movement which gave rise to the peculiar topography. Considered as topographic units, the plains are remarkable. The plain of Aldama, from 20 to 30 kilometres in width, extends from the Sierra de Naica on the south, without interruption northward, passing the international boundary and stretching into Arizona, a distance of about 500 miles. South of the Conchos river, the Chilicote plain, 75 miles wide, extends southward into the neighboring State of Coahuila, a distance of fully 275 miles. Dotted here and there over its surface, small ranges and lone peaks give the effect of an archipelago of rocky islands emerging from the ocean. Across the northern end of this plain lies the old road from Presidio del Norte, which constituted one of the principal thoroughfares between Mexico and the United States for the caravans of merchan-

quite and other brush at intervals. The atmosphere is dry and the rainfall light. Numerous attempts have been made to procure water by digging wells, and although the ground beneath is moist, most attempts have resulted in failure.

The bedrock of the Eastern region is composed mainly of marine sedimentary beds, that have been subjected to extreme folding by a force that seems to have operated uniformly along the entire Gulf slope, the disturbance in this section being the expression of the forces, that raised the Sierra Madre Oriental, and which probably began with the post-Laramie movement that elevated the Rocky Mountain chain. In the region under consideration, the folds formed parallel elevations with intervening valleys, their axes having a general northwest direction. The uplifted ridges constituted barriers, which, retaining the drainage of the region, formed

a parallel system of long narrow lakes, that extended north and south for hundreds of miles, and well back toward the Sierra Madre on the west. These lakes subsisted a sufficient period to allow deposition of immense beds of gravel, attaining a thickness of several hundred feet. Minor earth-movements during the latter period of the existence of the lakes, culminated in opening passages for the water through the mountain barriers, finally draining the lakes and determining the present water-courses.

Small areas of igneous rocks are scattered over the region, increasing in extent as the Sierra is approached; these igneous rocks form outliers of the tuffs and lava that make up the Sierra Madre. The lower sedimentary rocks of the region, that is, the rocks between and including the Boquilla slates and the Aurora limestones, probably extended westward to a shore-line about the centre of the Sierra Madre: the continent at that period stretching away to the west. After the deposition of the Aurora formation, the sea became rapidly shallower, as attested by the large amount of fossil wood and remains of land animals found in the Ojinaga beds. The shore receded nearly to the line now marked by the Rio Grande. Owing to the depth of gravel and silt, the bedrock is concealed to a great extent in the valleys and plains, though well exposed in the mountain ranges, especially along the Conchos river. The formations in these latter localities have been thoroughly dissected, offering good opportunities for their examination, although even at these points the excessive crumpling of the strata frequently obscures the relations of the beds.

The accompanying plan and section, although incomplete, will illustrate to some extent the geological sequence and conditions of the Eastern region. The names given to the formations are arbitrary, the writer's familiarity with the geology of the Mexican border being insufficient to permit the correlation of the formations with recognized horizons. The following detailed description is more for the purpose of setting forth the economic importance of the beds, than of a complete geological discussion. The formations will be regarded in the order of their succession, beginning with those apparently oldest.

BOQUILLA SLATES.

These are probably the oldest sedimentaries exposed in the region, the only locality where they were observed being in the gorge of the Conchos river, just above the Boquilla, near Santo Domingo. In this locality the slates are about 1000 ft. thick, forming the core of the Santo Domingo range, and extending both north and south of the Conchos. Their extent northward was not determined, but they were traced south almost to Coyamito mountain, a distance of 6 miles. The amount of distortion precluded following any well defined strike or dip. Neither could any well marked contact be found between it and the overlying beds, the two rocks being perhaps unconformable. The rock is a clay slate, extremely fissile, and having a tendency to break into small wedge-shaped fragments. Neither organic remains nor any other evidence to indicate the age of the beds could be found, except their in-

ferior position, which, taken together with their probable unconformability, suggests the possibility of a pre-Cretaceous origin.

The only sign of mineralization consists of small veins of quartz, the thickest of which was less than an inch wide, containing no metallic minerals, in spite of the fact that the overlying formations are rich in metallic deposits. It is evident that the texture of the rocks prevented their fissuring to a sufficient extent for the admission of mineral solutions.

PLOMOSAS FORMATION.

Above the Boquilla slates, sloping from the Santo Domingo range eastward toward the plain, may be seen a system of beds consisting mainly of limestones and shales, with a layer of conglomerate near the centre and quartzite at the base, having an aggregate thickness near Plomosas, of about 1150 ft. These beds extend along the eastern base of the Santo Domingo range, showing plainly at some points, and at others disappearing under the alluvium of the plain. Although the outcrop is interrupted south of Plomosas, it is probable that the limestones of the Cerro de Coyamito, south of the Conchos river, belong to these beds. No organic remains were noticed in this formation. Embracing the zinc and lead deposits of Las Plomosas and the copper prospects of Coyamito, this formation is of considerable economic importance, having produced and still yielding large quantities of ore. Referring to the sketch, and beginning at the base of the range where the beds emerge from the plain, there occurs 160 ft. of shale containing three interbedded layers of limestone, the latter with small deposits of lead and zinc, which lie practically parallel to the planes of bedding. The next in succession is a bed of massive limestone 450 ft. thick, in which the large ore-bodies are found, occurring as irregular deposits nearly parallel to the planes of bedding, and also in short fissures striking across the stratification. Under the massive limestone, layers of shale, aggregating 180 ft. in thickness, are followed by 80 ft. of conglomerate, both of the latter, so far as known, being barren of ore. Under the conglomerate comes 200 ft. of limestone, which is remarkable as containing iron and copper ores to the exclusion of lead and zinc.

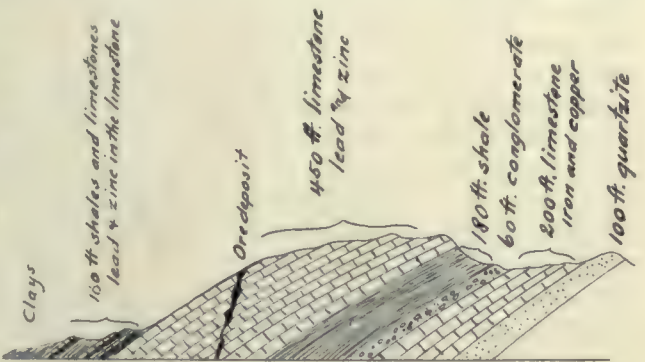
This is in contradistinction to the upper limestones, which contain lead and zinc, but no copper. At the base of the formation is seen a bed of quartzite 100 ft. thick, much shattered in places, and showing a network of quartz veinlets with an occasional trace of copper. All mining in the vicinity has practically been confined to the exploitation of the lead and zinc ores in the heavy bedded limestones near the centre of the formation, the copper prospects having received much less attention than they really merit, according to their surface-indications. South of the Conchos river, about 18 kilometres from Las Plomosas, the Plomosas formation again appears in the Cerro de Coyamito, where the beds are seen to dip toward the west. Small quantities of lead and zinc are found here, but the principal mineralization seems to consist of bodies of iron gossan containing traces of copper. These deposits occur in the central body of limestones, parallel to their bedding-planes,

and are traceable at least two miles, varying from one foot to a hundred in width.

ORE DEPOSITS OF LAS PLOMOSAS.

Just how long the mines of Las Plomosas have been worked is not of record, but it is likely they have been operated in a desultory way for a hundred years or more. Lead was the sole object of value in these mines in earlier times. The zinc being useless was left in the mine. The high price of zinc during the last few years, drew attention to the district, resulting in the re-opening of the old mines as well as the discovery of numerous orebodies hitherto unknown. The camp being situated within five miles of Pica-chos station, on the Orient railway, with which it is connected by a wagon road, makes it easily acces-sible. The mineral in the shape of smithsonite, has

next to the iron oxide, and extending from both sides toward the centre, were well defined streaks of smithsonite. Exemplifying the last phase of de-position, was a core of lead carbonate occupying the centre of the cavity. The separation between the lead-ore and the zinc was fairly well defined; that between the zinc and iron not quite so well defined, but still enough so to permit mining the ore com-paratively clean. In one of the stopes, the lead ore had been taken out by the old miners, thus leaving the zinc exposed on either wall, so that the present



Section at Las Plomosas.

operators had only to strip off the clean zinc ore. This was an extremely cheap method of mining, and, as one of the miners remarked, it was little short of finding the ore piled up on the roadside.

From the evidences which exist in the neighbor-hood, it is probable that these deposits have been formed from the decomposition of mixed sulphides of lead, zinc, and iron, and the successive re-deposi-tion of these minerals in the shape of oxides and carbonates. Small stringers of mixed galena, blende, and pyrite are found by cross-cutting the limestones, these stringers having retained their normal con-stitution through some condition which has pre-



Eastern Chihuahua, Mexico.



State of Chihuahua, Mexico.

been admitted into the United States free of duty, to which circumstance alone is due the profitable ex-ploitation of the ores. The lead and zinc minerals exist almost separately in the ore-cavities, passing from one mineral to the other so abruptly as to make a fairly clean extraction of the different ores. The extent of purity attained in the mining of the zinc may be understood when it is known that a great deal of the carbonate ore assays 50% Zn in large shipments. The purer ore is generally of a honey-yellow color, and aside from its weight, has at first sight more the appearance of a limestone concretion than that of a metallic mineral, the successive layers of the deposit being clearly distinct, and in some cases so thin that 16 layers to the inch may be counted.

The conditions of mineralization at the Juarez mine exemplify the type of ore deposit in the dis-trict, and merit description for this reason. This mine is on a short fissure of varying width, running obliquely across the limestones. The stopes showed, first, a deposit of calcite and iron oxide on the walls;

vented access of atmospheric water or other decom-posing agency. It is, therefore, likely that these streaks represent the primary mineralization. Ad-ditional evidence may be cited in the occurrence of native sulphur crystallized within the body of the calcite which forms the gangue of the deposits, this sulphur most probably having been derived from the decomposition of the original sulphides.

LAS VIGAS FORMATION.

Between the Plomosas and Las Vigas forma-tions, several hundred feet of rocks occur, which at all points examined were so covered with gravel and soil, that their nature could not be determined. It is prob-able, however, that they are the continuation up-ward of the shales seen at the summit of the Plomo-sas formation. The Las Vigas formation, through

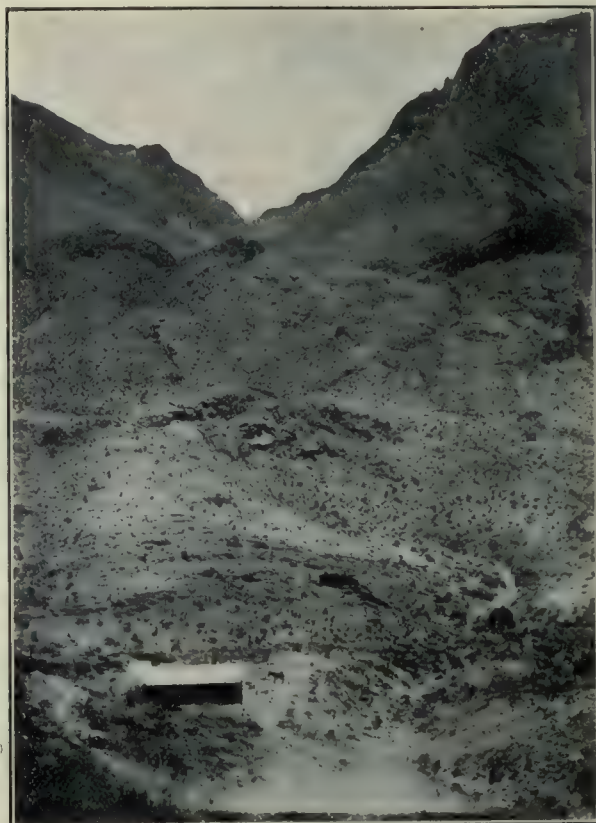
the hardness of the sandstones which constitute its most prominent feature, outcrops as a distinct ridge, traversing the country for miles. It may be seen in the long ridge traceable from Chorreras on the south to Las Trancas on the north, a distance of over ten miles, and at Cuchillo Parado for an even greater distance. The locality of Las Vigas, which has been described by Walter Harvey Weed, is, perhaps, the most familiarly known along the various outcrops of this formation. This fact has promoted the selection of that name to facilitate description. The conditions at Chorreras, however, although practically the same as at Las Vigas, are more familiar to the writer, and will be taken as a basis for description.

At Chorreras, the formation has a thickness of about 2000 ft., and consists of gray calcareous sandstone and shale in alternate beds, the latter rock predominating. Topographically, the formation is characterized by a succession of ridges with intervening hollows, the ridges forming the outcrops of the sandstones, the hollows indicating the position of the shales. The base of the formation as seen at Cuchillo Parado and Chorreras, is represented by a bed of arenaceous limestone, about 250 ft. thick, the next in succession being beds of calcareous sandstone, aggregating a thickness of 700 ft. In these latter are found the principal copper deposits belonging to the formation. Next occurs 240 ft. of black shale, followed by thin sandstones, which alternate with shales to an additional thickness of 750 ft., where it passes into the shales and gypsum of the Cuchillo formation. With the exception of a few obscure remains, resembling plant stems, no fossils were found. In spite of the extreme aridity of the region, this formation yields water plentifully at slight depths, most of the shafts that have been sunk revealing water in abundance. As a rule this water contains iron sulphate and free acid in solution. Water for domestic purposes is derived from springs in the neighboring formations.

The first mining of copper from this formation, so far as known, dates back to the year 1870, at which time the mines of Santa Sofia and Santa Cristina were actively worked, the ore, consisting of oxides and carbonates, being reduced on the spot in adobe furnaces with charcoal as fuel. As the workings penetrated the sulphide zone, operations were suspended, until the establishment of railroads and smelters in the Republic encouraged the re-opening of the old mines. As this involved a wagon haul of 75 miles to the Mexican Central, together with a costly railroad transportation to the smelter at Aguascalientes, this period of activity was short lived, and the mines again became dormant until the commencement of work on the Kansas City, Mexico & Orient railway drew attention to the mineral resources of eastern Chihuahua. About this time the Santa Cristina mine was acquired by the Hathaway Brothers, who began sorting the old dump, shipping the product to Aldama by wagon, and thence by railroad to the smelters, making a profit in a few months of \$10,000, that amount representing the purchase price of the mine.

The orebodies are parallel to the bedding of the formation, occupying and adjacent to narrow fis-

tures, made by the slipping of the sandstones on each other or on the shales. This movement must have been due to the excessive bending of the strata in the vicinity, causing the different beds to slip on each other as sheets of paper are seen to do under similar conditions. Evidences of such movement are conspicuous throughout the formation, although perhaps less so at points where extensive mineralization has caused partial disintegration of the adjacent rocks. The ores are exclusively copper, and consist of narrow streaks of solid mineral filling the cavities between the sandstone and shale. There is also impregnation of the adjacent rocks to some distance from the plane of movement, the workable ore varying from a few inches to 8 ft. in width. The shoots of ore are fairly constant, that of Santa Cris-



Santo Domingo Range.
Showing Fault, Upper Right-Hand Corner.

tina, which extends into the Justicia claim, being little less than a thousand feet in length. The ores at and near the surface, consist of carbonates and copper oxides, the carbonate stains coloring the rocks for a considerable distance from the veins. As permanent water-level is soon reached, the oxidized ores do not persist to any great depth, chalcopryite taking their place. Gray copper was observed at the mine of La Lágrima, three miles north of Santa Cristina, and it is worthy of note that this mineral assayed much higher in silver than either the chalcopryite or the oxidized ores, the gray copper carrying an average of 40 oz. per ton, while the latter seldom contain one-quarter of that amount. The gray copper is evidently a secondary mineral here, as it is seen to pass into chalcopryite near the bottom of the mine, although the lowest working is only 60 ft. below surface.

(To be Continued.)

BOSTON-SUNSHINE MILL.

Written for the MINING AND SCIENTIFIC PRESS
By G. W. WOOD.

In July, 1908, I was employed by the Boston-Sunshine Gold Mining Co. to design plans for re-modeling the old Sunshine mill, at Sunshine, Utah, and I afterward supervised the construction and have operated the mill up to date. The process as used and the method of treating the ore, were substantially the same as those followed in a number of mills in the Black Hills of South Dakota, which are operated by or under the supervision of J. V. N. Dorr, of Denver, Colorado, milling ores amenable to the same treatment, although the Black Hills ores are chiefly silicious, while at Sunshine the ore consists largely of 'talc'; in both of these, however, the treatment is practically identical. The history of the Sunshine mill, with its record of four unsuccessful attempts to treat the ore, is sufficiently well known. These failures were probably due to improperly separating the slime from the sand, and to consequent failure to properly leach the latter; also there was failure to get good extraction from the slime at a reasonable cost.

Prior to re-construction, the mill-building and such of the old machinery as was subsequently used, were in good condition, considering that the property had been idle for several years. In reconstructing this mill, the boiler and engine rooms, crushing room, hoist room, and the mine and crushed-ore bins, were allowed to remain intact, with the exception of a few minor changes and repairs; the lower end of the mill only being reconstructed and adapted to the new process. Hoisting, crushing, and elevating are done by steam-power; from that point electric power is used.

The process used is as follows: Referring to the plans of the re-modeled mill, the ore as it enters is tripped from a skip into the mine ore-bin; from here it drops by gravity over grizzlies, the fine ore going directly to the elevator boot, the over-size going to two gyratory crushers. From the crushers the ore goes through a revolving screen, the fine going directly to the elevator boot, the over-size to rolls and thence to the elevator boot. All of the ore is elevated by an endless belt bucket-elevator and dumped into the crushed-ore bin. From this the ore is fed to an endless belt conveyor by which it is carried up into a mixer-classifier, of a type designed by Geo. H. Dern, general manager for the Consolidated Mercur Gold Mines Co. The slime at the overflow end of this mixer-classifier goes by gravity to a Dorr classifier, the sand from the sand-end going to a second mixer-classifier. The sand from this goes direct to the sand tanks for leaching, the slime to the Dorr classifier, together with the slime from the first mixer-classifier for further classification. From the Dorr classifier the sand goes direct to the sand tanks for leaching, mixed with sand from the second mixer-classifier, and thence to the sand tailing dump. The slime goes to a 12 by 35-ft. settling tank, in which is operated a Dorr continuous slime-thickener. The thickened slime is drawn out at the bottom of this tank through a 4-in. pipe, as desired, by opening

and closing a gate-valve operated from the Moore-process floor, and is forced by difference of head to the charging-vat of the Moore process.

The Moore process, as installed here, consists of three rectangular vats, with hopper bottoms, and two sets of filter-leaves built up in two movable frames, connected to vacuum-pumps; also an additional vat for cleaning the filter-leaves. The operation of the Moore process is as follows: A clean frame is first immersed in the charging-vat. The suction from the pumps then draws the mill-solution from the thickened slime through the leaves. This comes out as 'gold-solution,' and at the same time the pulp builds up a cake on the leaves, requiring from 30 to 45 minutes to make a cake $\frac{7}{8}$ in. thick, dependent upon the thickness of the pulp. After having picked up about a $\frac{7}{8}$ -in. cake, the frame is lifted by means of a hydraulic crane, and is deposited in the barren-solution vat, where clear barren solution is drawn through for further extraction of the metal in the cake already picked up. After a given length of time, dependent upon the assays, the frame is moved from the barren-solution



Boston Sunshine Mill.

vat to the wash-water vat. In this, wash water is drawn through the frame for a sufficient length of time to extract the remaining metal which may be recovered advantageously, and to displace the cyanide solution in the filter-leaves and cake. Water and air are then forced through the leaves in inverse order, the cake drops off, and falling to the bottom of the vat is forced out as slime-tailing, by the head of water above it. This is done by opening a sluice-gate operated from the Moore-process floor. Both frames are operated continuously at the same time, but, of course, each frame being at a different stage of the cycle. The constant-level tanks, operated by means of float-valves, ensure a uniform rate of flow throughout when the valves are opened at given points.

A series of gauge-boards, assembled at the Moore-process floor, with wires connected to floats in the mill-solution storage, mill-solution sump, barren-solution storage, barren-solution sump, and gold-tanks, indicate at all times, at this point, the tons of solution which these tanks respectively contain. An electric gong, also connected with the same, rings when any of the tanks are filled within a given distance from the top. This ensures prompt attention without close watching, and prevents the tanks from overflowing. Sampling is done in this mill auto-

matically. At the elevator head is an ore-sampler making uniform grabs, and operated at regular intervals by means of dumping-buckets, placed over the mill-solution sump, with which it is connected. A sampler over the barren-solution sump, operated by the solution flowing through it, continuously measures the amount of barren solution going into the barren-solution sump, and at the same time takes uniform samples at regular intervals. This sampler also operates another, taking uniform samples of gold-solution flowing into the gold-tanks, simultaneously with the barren-solution sample. The tons of solution registered by the first sampler multiplied by the value of the gold-solution sample, less the value remaining in the barren-solution sample, is the value precipitated. For a period of five months this sampler, in one of the Black Hills mills, has checked up within 0.11 of 1% with the bullion.

In the general arrangement of this mill, in comparison with some others, it may seem crowded, but in this instance it is a distinct advantage. Everything in connection with leaching is in sight, or is at hand, and can be reached from the Moore-process floor at a moment's notice in the event of anything going wrong. A man standing on that floor, on the side toward the sand-tanks, can see the pumps, shafting, and motor in the pump-room below, and the Moore-process pumps and other apparatus on the floor he is on. Above him are in sight the classifiers, launders, conveyor, motor, and shafting; the gauge-boards at his side keep him posted as to the quantity of solution in the various tanks and sumps. A few steps up and he can look directly into the sand and settling-tanks.

The ore, by differences, from actual milling, has consisted of 50.85% sand and 49.15 slime; sand-tailing has averaged about 60c., slime-tailing 20c., the general tailing for the month of May having been 39.3c. The heads during May averaged \$3.48. Two hundred tons of ore have been treated in this mill in 24 hours without appreciable inconvenience. The extraction for the month of May, the second month's run, was 88.7%, at a cost of milling of 84.9c. per ton of ore.

HAND CHURN DRILLING.

Written for the MINING AND SCIENTIFIC PRESS
By O. H. PACKER.

Hand-churn drills are used for testing foundation-soil and rock for large buildings, piers, and the like, and for drilling holes for blasting cuts for railroads and wagon-roads, especially when only a small amount of work is necessary, or when the rock is extremely soft. They are made of ordinary octagonal or hexagonal drill-steel, except that, when holes over 30 ft. deep are required, hollow drill-stems are used. Taper-joints should be used for the connections, because this kind of joint is less liable to become loosened than a common pipe-joint, and is about twice as strong. The threads should be kept clean and protected from injury by thread-protector caps.

The hole is begun with a hand-hammer and short drills called 'starters,' one man turning the drill for one or two strikers. The 'starters' are used till the holes are 6 to 8 ft. deep, though in extremely hard

rock striking may be continued as long as satisfactory progress can be made. In churning, one or two men churn the drill up and down, making strokes about one foot long, and turning it slightly at each blow. Water is poured in as required, and the hole is cleaned out with a sand-pump instead of a 'spoon scraper'. This so-called sand-pump is simply a length of thin casing provided with a valve at the bottom, and attached to a rope for lowering and hoisting. In drilling through gravel, or in any case where the hole has a tendency to cave, clay is dropped into the hole at regular intervals. This plasters the hole and answers the purpose of a casing in a feeble yet satisfactory way. As the hole is deepened, requiring longer, heavier drills, more men are employed, five being the greatest number that can conveniently work on one drill. Even with four men some device for securing detachable arms to the drill-stem is desirable. When the weight of the drill becomes excessive the bit is screwed to hollow stems. By this means holes have been churned over 70 ft. deep. Casing can be used in conjunction with hand-churn drills, the drillers standing upon a platform secured to the casing. The weight of the drillers forces the casing down as it is turned by means of flat-link chain-pipe wrenches.

In testing foundation-soil and rock the composition of the formation may be determined by examining the material brought up by the sand-pump with a good hand magnifying lens. The hardness of the formation can be most satisfactorily determined by the 'feel' of the drill as it strikes the bottom of the hole. In making cuts through hills or ridges for roads, two rows of holes are drilled the entire length of the cut, the distance between the holes being made about equal to their depth. If the rock is quite hard it will be found more satisfactory to make the depth greater than the spacing distance. In any case the holes should be drilled from 2 to 4 ft. deeper than the required grade. If the holes are drilled only 2 ft. below the grade a ridge will be left to be later drilled (by hand-hammer drill) and blasted. It is better to drill 4 ft. below grade, so as to shake up and shatter the rock down to grade. This latter method will result in a saving of money, because the cost of churning 2 ft. deeper will be less than that of drilling and blasting out the ridge between the rows of holes. There are cases, however, where it is not permissible to drill below grade. When this is the case some advantage is had by spacing the holes closer.

The speed of hand-churn drilling is about the same as that with double-hand hammer drills in drift mining in similar rock. The cost of churn-drilling will, therefore, vary from hand-hammer drilling according to the number of men employed to operate the drill. Hand-churn drills may be used for many kinds of work not mentioned above. For example, they may be used to good advantage in making prospect cuts and holes, and for grading for mill-building foundations. For such purposes a 10 or 12-ft. hole will usually be sufficient. This is 'sprung' once or twice, loaded with black powder, and fired. If several holes are to be fired at once use an electric blasting machine, so as to fire all the holes at the same instant.

GASES RESULTING FROM HIGH EXPLOSIVES.

By WM. CULLEN.

*The explosive mostly used on the Rand is blasting gelatine; practically no other is employed in driving, developing, and shaft sinking. My work has been mainly confined to the gases resulting from the use of this explosive, occasionally slightly modified on lines which will be indicated. On being completely detonated, only carbonic acid, vapor of water, and nitrogen are formed—all comparatively innocuous gases. The particular equation which shows this result is confirmed by explosion inside a steel bomb. Incidentally, I may mention that the cartridge wrapper, which Dr. Moir assumed took part in the explosion and led to the production of carbon monoxide, does not do so, at least not to any extent, as I have demonstrated more than once. This, however, is a side issue. My contention has always been that if the conditions of the steel bomb were imitated as nearly as possible in practice, we should get results which at least approximate to the theoretical, that is, if the explosive is carefully tamped and certain other precautions taken. In no case was I able to get results which have the slightest resemblance to the theoretical. All the experiments were conducted in drifts, that is, on development work, and a sample of the mine-gas was generally taken before blasting—at a certain point. Immediately after the blast and before any air was turned on, the sampler proceeded to the same spot, generally 30 to 40 ft. from the face, wearing a safety helmet, and again sampled the gases from the blast. The actual sampling was done as follows: At the point fixed on, the sample bottle was opened, air was introduced into it by means of the bellows, which were emptied and filled 50 times. The same operation was gone through after the explosion. Scores of samples of mine-air have been analyzed, and although in most cases I have been given permission to make use of the figures, I do not propose to avail myself of this privilege to any extent. I may say, however, in passing that most of the samples were very bad indeed, though it is only fair to add, that in many cases those samples were taken from particular parts of the mine which were known to be bad. The astonishing thing about all these analyses is the almost universal presence of carbon monoxide, and more often than not, in dangerous quantity.

There is a general impression that old explosives give much worse results than new; and that is so, as most people know, when we speak of the age of explosives in terms of years. Again, there is a difference of opinion with regard to the best size of detonators, some contending that better results are obtained with No. 8 than with No. 6, and vice versa. With regard to tamping I hold rather extreme views. I have always had the idea that the current practice of employing sand cartridges was wrong in principle on account of the friable nature of the sand. Clay, to my mind, was infinitely preferable, so a comparison was tried. Incidentally, I may mention that Mr. Leslie, of the Simmer & Jack, who holds similar

*Abstract from Jour. Chem. Met. & Mg. Soc. of South Africa.

views to my own, employs clay, and asserts that he gets much better work in practice. Then there was the vexed question of the benefit, or otherwise, of the so-called neutralizers, or anti-fume mixtures, of which there are sundry varieties on the market. There were various minor points, but the most important of all was to ascertain whether better all round results could not be obtained from a blasting gelatine which was so modified as to contain within itself more than the normal amount of oxygen. These experiments are unfortunately not yet concluded, but they have already given some valuable data.

I look upon the analyses of the resultant gases as the most accurate means of measuring the work done. The more completely the explosive is resolved into the simple gaseous mixture of vapor of water, carbonic acid, and nitrogen, the better should be the 'footage', to use a technical term. Certain experiments seem to incline this way, but the results are not conclusive, and the experiments must be continued. No matter how perfect the conditions were, large amounts of carbon monoxide were always formed, and incidentally the conditions under which the experiments were carried out were above the average, in so far as exercise of care is concerned.

In every case when not otherwise specified the tamping used was the ordinary sand cartridge.

TABLE I. RESULTS OBTAINED FROM BLASTING ROUNDS.

| No. of experiment. | Explosive. | Detonator | Distance from face. | Gas Composition. | | Ratio of CO to CO ₂ |
|--------------------|---|-----------|---------------------|------------------|-------------------|--------------------------------|
| | | | | CO % | CO ₂ % | |
| 1a ... | Ordinary blasting gelatine | 6 | 35 ft. | 0.012* | 0.134* | 1—7.8 |
| 1b ... | 3 months old | | | 0.88 | 6.32 | |
| 3a ... | Newly made blasting gelatine | 6 | 27 ft. | 0.026* | 0.328* | |
| 3b ... | Ordinary blasting gelatine | | | 1.09 | 6.56 | 1—6 |
| 4a ... | 3 months old | 8 | 44 ft. | 1.28 | 8.07 | 1—6.3 |
| 4b ... | Blasting gelatine 3 months old with neutralizer | 6 | 35 ft. | 0.021* | 0.290* | 1—8.2 |
| 2a ... | Special composition blasting gelatine | 6 | 40 ft. | 0.013* | 0.50* | |
| 2b ... | Special composition blasting gelatine | 6 | 40 ft. | 0.56 | 3.7 | |
| 5a ... | Special composition blasting gelatine | 6 | 40 ft. | 0.011* | 0.216* | 1—6.6 |
| 5b ... | Modification of 2 | 8 | 16 ft. | 0.007* | 0.123* | 1—7.9 |
| 12a ... | Modification of 5 | 8 | 20 ft. | 0.718 | 6.05 | 1—8.4 |
| 13a ... | Modification of 5 | 8 | 20 ft. | 0.026* | 0.058* | 1—9.3 |
| 13b ... | | | | 0.66 | 6.20 | |
| 14a ... | Different make of blasting gelatine | 6 | 36 ft. | 0.035* | 0.25* | |
| 14b ... | | | | 0.467 | 4.00 | 1—8.5 |

a and asterisks indicate before blasting. b after blasting.

Table I deals with a series of experiments which are almost self explanatory, but in calculating the ratio of CO to CO₂, the figures of which appear in the last column, I have made no correction for the amounts present in the gases before the blast, though in some of the cases it is evident that they would materially affect the ratio. My reason for not doing so is that I do not think there are sufficient data to go upon. The one point which is established beyond the shadow of a doubt is, that carbon monoxide is always formed in large, and even dangerous quantity. The presence of the large percentage of carbonic acid calls for no remark, and where larger quantities than the usual are indicated, the natural conclusion is that the sample has been obtained in a concentrated form. Strange to say, no trace of nitric peroxide was found in any of the samples, though we would not be justified in asserting that it was not formed. I think myself it must have been formed in every case.

On the question of tamping, divergent opinions are held. I believe that good clay is infinitely better than

sand, and if trouble were taken to procure it and to make it up into proper cartridges much better results would be obtained. The experiments given in Table II are only of a preliminary nature, but they are interesting as indicating a decided improvement in favor of dagga, which, as you know, is at least an approximation to clay. The tamping cartridges were made up in the usual way with the dagga dry, but they were used damp, which makes it somewhat sticky or adhesive.

TABLE II. INFLUENCE OF TAMPING.

| No. of experiment. | Tamping. | Distance from face. | Gas Composition. | | Ratio of CO to CO ₂ |
|--------------------|--------------------------------|---------------------|------------------|-------------------|--------------------------------|
| | | | CO. % | CO ₂ % | |
| 15a | Dagga cartridges..... | 47 ft. | 0.356* | 0.049* | 1—7.93 |
| 15b | | | 4.60 | 0.58 | |
| 16a | Ordinary sand cartridges | 47 ft. | 0.258* | 0.050* | 1—6.5 |
| 16b | | | 1.84 | 0.28 | |

a and asterisks indicate before blasting.
b indicates after blasting.
Ordinary blasting gelatine used with No. 8 detonators.

In a later paper I propose to deal with the subject of blasting by electricity, and the figures given in Table III have reference only to a phase of that question. We all know that comparatively large amounts of carbon monoxide are produced from the burning fuse, and the amount used for the blasting of a round is from 72 to 96 ft. The cut is generally drilled so as to make holes converge at the bottom, and this in practice means that the cut comes away at one blast. I had an idea that firing by electricity, which ensured the simultaneous detonation of all the shots, would give better results, and the figures of this table certainly indicate a little improvement. Against this is, of course, the production of carbon monoxide from the burning of the fuse, but from other experiments it does not appear that the amount from this source could seriously vitiate the results given. In No. 10 only three holes were fired, as against four in all the others.

TABLE III. RESULTS OBTAINED FROM BLASTING CUTS.

| No. of experiment. | Explosive. | Detonator | Distance from face. | Gas Composition. | | Ratio of CO to CO ₂ |
|--------------------|-------------------------------|--------------|---------------------|------------------|-------------------|--------------------------------|
| | | | | CO. % | CO ₂ % | |
| 8a | Blasting gelatine 3 weeks old | 8 | 12 ft. | 0.014* | 0.35* | |
| 8b | | | | 0.195 | 1.63 | 1—8 |
| 9b | Blasting gelatine 3 weeks old | elec dets | 27 ft. | 0.208 | 2.03 | 1—9.7 |
| 10a | Blasting gelatine 3 mo. old | elec dets | 27 ft. | 0.017* | 0.23* | |
| 10b | | | | 0.205 | 1.72 | 1—8.4 |
| 11b | Blasting gelatine 3 mo. old | 8 | 27 ft. | 0.22 | 1.71 | 1—7.7 |

a and asterisks indicate before blasting.
b indicates after blasting.

The results of the foregoing experiments were so surprising and unlooked for that I next decided to try gelignite, which is used for development at some mines. Gelignite may be described as a low-grade blasting gelatine to which is added organic matter in the form of wood pulp and nitrate, so proportioned that the oxygen from the nitrate is capable of oxidizing all the organic matter. Whether this oxidation is complete or incomplete has never been determined in practice, but judging from the analogy of ordinary black powder one would be safe in assuming that the combustion would not be complete.

According to theory, 12b and 13b should have furnished free oxygen, particularly 13b, but they do not. This is hardly surprising in view of the fact that the results obtained all through deviate so much from

the theoretical. I would again direct attention to the high CO to CO₂ ratio of 13b, the highest so far found. It is stated in another way in Table I, but does not show up quite so high there, though the difference is not great.

TABLE IIIa.

| Gellignite. | Before blast. | After blast. |
|-------------------------|---------------|--------------|
| Oxygen | 20.310 | 17.96 |
| Nitrogen | 79.300 | 74.52 |
| Hydrogen | nil. | 0.11 |
| Carbon monoxide | 0.028 | 1.23 |
| Carbon dioxide | 0.362 | 6.18 |
| Olefines | nil. | nil. |
| Oxide of nitrogen | nil. | nil. |
| | 100.000 | 100.00 |

Proportion of CO to CO₂, 1 to 4.9.

The examination of every-day mine gases with regard to their vitiation is outside the scope of this paper, and no useful purpose will be served by directing attention to particularly bad samples. I can say in general terms that some of the places underground were unfit for human beings to work in, and it was wonderful how they managed to do so. On the other hand, some of the analyses indicated a purity almost equal to the atmosphere at Sea Point, but while gladly admitting this, I wish to make it clear that I think the subject of ventilation is not receiving that amount of consideration which it ought to do in the light of the advances which are being made in other directions. I believe that few of those responsible for practical operations in the mining industry realize the importance of the subject, and what economic advantages improved ventilation would bring in its train.

The conclusions at which I have arrived may be summarized as follows:

(1) Carbon monoxide is produced in large quantities on the detonation of blasting gelatine, under the ordinary conditions of practice.

(2) The so-called neutralizers or anti-fume mixtures do not appear to have any influence one way or another.

(3) Clay-tamping seems to give better results than ordinary sand-tamping.

(4) Freshly made blasting-gelatine gives no better results than that which is three months old.

(5) With an age limit of three months a No. 6 detonator seems to answer as well as a No. 8.

(6) Blasting-gelatine of the nature of 13b seems to give better results than the ordinary blasting-gelatine.

(7) Firing by electricity seems to give slightly better results than ordinary time-fuse.

(8) The ordinary quantity of fuse used vitiates the mine atmosphere to a very large extent.

When holes are required deeper than 6 or 8 ft. it is necessary to use either a hand or power-driven churn-drill, because effective work beyond that depth with hand-hammer and drill is impossible, owing to the fact that a long drill 'takes up' the force of the blow with the hammer. As churn-drill holes are made by churning the drill up and down in the hole, the depth that can be thus reached is limited by the available power for lifting the drill-tools. Holes over 1000 ft. deep are often made with a steam-driven churn-drill.

MINERAL DEPOSITS IN TREBIZOND.

The Province of Trebizond, lying along the southern shore of the Black Sea, in Asiatic Turkey, holds brilliant promise for a flourishing universal industry. It was described in a general way by Leon Dominian in an article, 'Mines and Mining in Turkey', published in the MINING AND SCIENTIFIC PRESS, June 12, 1909. The accompanying map gives more detail concerning the region, its division into districts, and the distribution of mines. In the district of Surmene all the deposits represented contain copper with the exception of those numbered 1 and 4, which yield manganese. In Yomoura all the mines are of copper, No. 1 yielding a complex ore, containing zinc, and No. 6 showing considerable amounts of arsenic. Both No. 1 and 6 are basic ores with a large excess of iron. In the district of Djevislik silver occurs with the copper in mines No. 1, 3, and 10, and No. 7 and 12 are highly basic copper ores, with coal in close proximity to No. 7. In mines No. 10, 13, and 16 lead is also present. Lead is associated with the copper ores in Kalanema-Dere Fol

up docks when the traffic warrants the outlay. The first section of the railway of 105 kilometres (65 miles) was completed and ready for traffic in July of the present year, and opens one of the richest and most populous districts in the country, whence the products should find ready markets, not only on the Coast but in the United States and Europe. In addition to the mineral wealth of the district the whole route tapped by the Chimbote-Recuay railway is very rich in minerals, principally copper, silver, and gold, and while many mines are already operating, the majority are waiting for the railway.

COPPER IN JAMAICA.

Recent explorations have been made in Jamaica, mainly in the Clarendon hills, exposing large deposits of copper silicate (chrysocolla), copper pyrites, cuprite, bornite, malachite and azurite, copperglance, and other copper ores, carrying silver and gold. The existence of copper in Jamaica was evidently known to the Spaniards several centuries ago, as the name of one of the large rivers, Rio Cobre (Copper river) indicates. When the English took



Province of Trebizond, Asia Minor.

in mines No. 1, 2, and 4; No. 3 is a maganese mine. The district of Charly yields copper from all the known mines, silver being found in notable quantities in No. 2, 3, and 10. Tireboli also possesses extensive copper deposits, with lead in No. 3, 5, and 6. Manganese in workable amount exists at No. 1 in Kerassund, which is held by a 'firman' or concession for 99 years. No. 2 is a silver-lead property, No. 3 is a silver-lead mine containing much antimony, No. 4 is a copper-lead deposit, while the others are copper mines, with coal adjacent to No. 10. An exceedingly complex mixture of copper, zinc, lead, and antimony is found at No. 11 in this province. In Ordou argentiferous lead-copper ore occurs at No. 2; lead and copper at No. 3; lead alone at No. 5; and copper at all the others, with the exception of No. 8, which is a coal mine, and No. 1, which is a hot spring called Yumre, held by Faik Pasha on a 55-year concession.

possession of the island in the seventeenth century they devoted their attention to agricultural pursuits which yielded immense profits. It is of record, however, that in the year 1854 samples of copper ore were sent from the island to the Revere Copper Mining Co., of Boston and smelted, producing about 24% metallic copper.

A number of Boston men obtained a lease in 1906 of no less than 2267 acres of land in the Clarendon hills, nearly 4 square miles, with an option of purchase within a few years, and since then they have been spending their own capital prospecting and developing the deposits. Rapid progress has been made, and these recent copper developments give promise of great economic value and importance to Jamaica in an entirely new and hitherto undeveloped field. There were about 75 laborers at work on the mines recently, and 62 openings had been made. From more than 40 of these, ore has been taken showing profitable copper content, all carrying silver and gold. The climate is such that work can be carried on throughout the entire year. More than 1200 ft. of tunnels had been made up to March last. The mining will be done entirely through tunnels; no pumping of water or hoisting of ore will be necessary, hence it will be comparatively inexpensive.—*Engineering Magazine.*

One of the most important enterprises in the development of Peru, now being carried out, is the construction of the railway for the Chimbote Coal & Harbor Syndicate, Ltd., which will run from Chimbote to Recuay, a distance of 168 miles. This syndicate also possesses a mole which is under reconstruction, also extensive coalfields, and is prepared to fit

GAS ENGINES FOR MINING PURPOSES.

Written for the MINING AND SCIENTIFIC PRESS
By A. S. ATKINSON.

The electrification of mines has greatly simplified operations in recent years, and has also reduced the fire and explosion hazard, and where current can be obtained from some near-by hydro-electric plant it is undoubtedly the cheapest and most efficient method of operating the various machines and apparatus. Almost every phase of work about a mine can advantageously use electricity, including hoisting, signaling, lighting, driving, ventilation, hauling and tramming, firing of shots, surface-work, and ore-treatment.

Comparatively few mines are so situated that they can draw upon hydro-electric power-plants for their current, and the cost of power-development of any kind becomes to them of more importance than the question of form of transmission. It is in such mines that large gas-engines and more recently large suction producer-gas plants have entered as new factors. Mining operators a few years ago were prejudiced against gas-engines for mining purposes owing to their general unreliability. Through the more recent development and perfection of gas-engines mine owners have seriously taken up the question of using them. There is no disputing the remarkable achievements of gas-engines in other fields.

Gas-engines of large capacity reached their first development in Europe where the fuel problem is more acute than in this country, and likewise the suction gas-producer was more generally adopted there than in the United States. One must frequently look to European mines for data concerning the development of new power-producers. Economy of fuel-consumption is of primary importance there. Frequently the European mines could be operated upon the waste found around American coal mines. One of the most significant experiments with gas-engines for mining operations has been conducted at the Powell Duffryn Collieries in South Wales, and the results are not without their lesson. In the South Wales collieries the power-equipment consists of two large gas-engines, one of 1200 hp. and the other of 2400, which is one of the largest gas-engines ever installed in a mine of any description. These gas-engines are coupled to alternators for supplying three-phase current to different parts of the mines. The big gas-engines are started by compressed air which is stored in tanks at a pressure of 300 lb. per square inch. This makes attendance cheap and simple. Under ordinary circumstances, the engine-room staff consists only of one switchboard attendant, and a driver and cleaner for each engine. The engines are run almost continuously without stop from one week's end to another, with the exception of Sundays when they are cleaned and overhauled. Any accumulation of carbonized oil on the pistons or cylinder-covers is then removed and the plant oiled and cleaned thoroughly. The cooling-water for the engine-jackets is stored in a reservoir about 80 ft. above the level of the engine-floor, and this gravity-feed always insures a steady and uniform supply. There is a large amount of hydrogen in the

gas, and this tends to cause pre-ignition at a comparatively low pressure, and the engines are built to operate under a compression of gas ranging from 90 to 105 lb. In spite of this, however, the thermal efficiency is quite high and very satisfactory. In tests made with the gas-engines operating under full load it was found that they were using 12,300 to 13,000 British thermal units, and developing a full load capacity under all ordinary conditions.

Since the installation of these gas-engines in the collieries there has been no shut-down, and only one slight interruption of a few hours to one engine, which amply testifies to the reliability of the equipment. Before the gas-engines were installed the mine equipment for power-generation was entirely of steam, and the cost was from 10 to 20% higher than under the present method. The saving is obtained as much in the cheaper cost of attendance as in the consumption of fuel. Plans are now being matured for installing two more engines of large capacity in the collieries. This gas-engine plant for mining operations is not so up-to-date as others installed in this country and in England, but it is such an improvement over the older equipment that it represents a distinct advance. The suction gas-producer is looked upon by many mining engineers as ideal. The development of the suction gas-producer is a matter of comparatively recent history. Its growth has been extraordinary, and its adaptation to many kinds of work is a feature of mining and manufacturing industries. While the producer has reached a high stage of efficiency for operation on fine grades of anthracite coal, the more important question of adapting it to burning various forms of bituminous coals is more recent. The requirements of such a plant are exacting. In the first place there is demanded a producer capable of continuous and uninterrupted operation. Reliability of the plant is of first importance. It should also produce a gas free from tar, and operating at such temperatures as would avoid troublesome clinker formation. A suction producer that would possess these virtues, and at the same time be so simple and easy of operation that comparatively little skill on the part of the operator would be required, would prove a boon to mines. Of course the gas produced would have to be suited to high-compression engines.

It has not been easy to secure a suction producer that would possess all of these qualifications, and the improvements have come about gradually, if not quickly. Today suction gas-producers that approximate these results are built both in this country and in Europe, and the satisfaction they give is their best recommendation.

As an illustration of the early use of a suction gas-producer in mines attention might be called to the gas plant at the Threlkeld mines at Cumberland, England, where operations have been going on for several years. This plant has a producer modified to suit local conditions and the fuel most abundant, which is Scotch anthracite, of pea size. There are two gas generators, and the engines are directly connected by a flexible coupling to 60-kw. direct-current generating sets that run in parallel. The fuel

is fed into the producer by means of a storage feeder and hopper so that a large body of incandescent coal is supplied below and a fresh supply held above ready for use and warmed to a high temperature at all times. This prevents any sudden cooling of the fire by fresh charges.

One of the difficulties encountered with producers of all kinds is efficient working under light loads. The loss of efficiency when working under light loads was one of the weak points of the early producer plants, but this has been overcome. If the plant works for some time under light loads, the fire is apt to decline to such a point that a good quality of gas fails of generation. The suction is reduced to such a point that there is not sufficient fresh air drawn in to keep the fire active without auxiliary equipment. This is overcome in modern producers by auxiliary blowing apparatus or by a by-pass fitted between the gas-pipe and the mixing chamber, so that an additional small supply of air is drawn in to suit the light-load operations. In nearly all mines the gas plant must run on a light load during the night, usually for lighting and pumping purposes alone, and the necessity of having an efficient plant that will operate economically under such conditions is important. At the Threlkeld mines, the fuel consumption averages one pound of anthracite coal burned per horse-power hour, and compared with a steam-plant this is economical. Also the cost of attendance is considerably lower than for a steam equipment. Again the stand-by loss is unusually low, and compares favorably with a steam-engine. At the Threlkeld mines a number of tests have been made to secure reliable data concerning the use of the suction gas-producer for winding, pumping, lighting, and ventilating by electricity. These experiments were made within a year after the initial installation, and when the plant had been well keyed up and had proved reliable in operation. The results of these tests showed that the fuel per hour used for developing each kilowatt-hour amount to only 1.50 lb., with an average dynamo-load of 40.1 kilowatt-hours. In these tests the efficiency of the dynamo at two-thirds load averaged 85%. The calorific value of the coal used was 13,556 British thermal units.

One of the newest suction producer-gas plants developed in this country by American manufacturers for working on different grades of bituminous coals for mine purposes shows results that are of even more value to the mining industry. Tests have been made with this producer with South American lignite coal, Colorado lignite, Texas lignite, Massachusetts meadow peat, and Pittsburg run-of-mine coal. All of these low-grade fuels have given excellent results in the producer. The Pittsburg run-of-mine coal showed an economy of 1.1 lb. per brake horse-power hour in a 24-hour operation, and the lignites averaged an economy of 1.6 lb. for continuous service. The efficiency of this producer in the tests did not vary more than 10% from full to no load, and approximated 77.5 on total heat-value, or 71.5% on effective power-value basis. The average samples of gas taken from the engine showed a heat value of about 115 British thermal units effective power-

value. A high-grade gas was not desired, as the compression was moderately low, although a high-grade gas could have been obtained by admitting more oxygen.

The perfection of electrical winding will greatly simplify the application of electricity for general mine use, and it is by the introduction of the suction gas-producer that collieries and metal mines will receive the full benefit of this improvement. Electricity for general mine uses has demonstrated its efficiency and reliability. But it is the cost of securing the current that concerns most mine owners. Where cheap hydro-electric power can be obtained the problem is easy, but for the hundreds of mines not so favorably situated the suction gas-producer promises much. In many inaccessible districts it simplifies operations and increases the efficiency, and it may often prove the determining factor between success and failure.

The Empresa de Navegación Louis Gieseken and the Magdalena River Steamboat Co., with respective fleets of approximately 21 and 15 stern-wheel steamboats and various smaller craft, such as lighters and barges, have for some time controlled the traffic of the Magdalena river, Colombia. They also carry the mails, with Government subsidies of \$1000 gold per voyage, between Barranquilla and La Dorada or Puerto Berrio and return, there being five mail steamboats per month. The new Compañía Antioqueña de Transportes will enjoy the same rights, except the mail subsidy. Its capital is \$300,000 gold, 90% of which has been subscribed in Medellín, the remaining 10% being divided among residents of Bogotá, Barranquilla, and Manizales. Four years ago the company was engaged in river traffic, with two boats, and is resuming operations with promising prospects. Two stern-wheel boats of the type commonly used on the Mississippi, with electric lights and other modern conveniences and equipment, were ordered last October from James Rees & Sons Co., Pittsburg, Pennsylvania. The first steamboat arrived about the middle of April. It is claimed that they are bigger and better equipped for both freight and passenger service than any boats now plying on the river. They will be called the *Medellín* and *Caldas*, are of 380 tons each, 170 ft. long, 33 ft. beam, with 4 ft. 6 in. depth of hold, and will draw approximately 4 ft. of water when carrying full cargo. The company possesses excellent facilities at Barranquilla for handling and storing cargo, a switch from the local railway having been built into their sheds at the pier so that cargo can thus be transferred from the river steamers directly to the cars and thence conveyed, without further handling, to the ocean steamers at Puerto Colombia, and vice versa. As the company is practically owned by citizens of the Department of Antioquia, generally considered the greatest ore-producing region of Colombia, it may naturally be expected to secure a large proportion of the ore and machinery shipments of that district, all of which should result favorably to the American mining men in the interior, as well as to the manufacturers of mining machinery at home, as to both freight rates and improved service.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

GENERAL LECTURES ON ELECTRICAL ENGINEERING. By Charles Proteus Steinmetz. 8vo., pp. 284; Ill. by diagrams. Robson & Adey, Schenectady, N. Y., 1908. Price \$2.

Any utterance by the wizard electrician of Schenectady must command world-wide attention. Mr. Steinmetz was well named Proteus; he has rapidly taken every part in the shifting play of electrical progress. Like all great men, he displays the characteristic of extreme simplicity, which is the same as saying that his view is straight and clear, so that his account of what he sees is lucid, plain, direct, and logical. He makes no bid for favor by putting on the outer garments of complexity. It is a delight to read these lectures. Criticism is superfluous in connection with a book by a past-master of an art. Errors, and personal convictions there may be, but the suggestiveness of the volume is the reason for reading it; the dull practical details can be had in a hundred books, but the pregnant hints come only from such as this. As an example, in discussing high-tension transmission, he refers thus to lightning discharge: "The illumination given by a brilliant lightning flash is about of the same magnitude as good artificial illumination, perhaps one-foot candle, since at night time in a well lighted room, the light of a lightning flash is still quite appreciable. Estimating roughly one watt per candle foot, a lightning flash illuminating a space of two miles square or 10⁸ square feet, with one-foot candle would consume 10⁸ watts, and as this is the illumination as averaged by the human eye over 0.1 seconds, the energy is 10⁷ watt-seconds, or 10,000-kw. seconds. The energy of a large lightning flash, estimated from its light, would thus be of the magnitude of 10,000-kw. seconds. This value, while considerable when expressed in electric quantities, is by no means so very great; reduced to heat measure, it only equals the latent heat of evaporation or condensation of about 9 lb. of water."

STEAM POWER PLANT PIPING SYSTEMS. THEIR DESIGN, INSTALLATION, AND MAINTENANCE. By William L. Morris. 8vo. Pp. 506, Ill., Index. McGraw-Hill Book Co., New York, 1909. Price \$5.

This work is a systematic discussion of the problems arising in the design of piping systems in connection with high-grade steam-power installations of the present time. It enters into the minutest detail of economic questions involved, in designs leading to higher efficiency in service, and in the practical questions of plan and installation. The book contains 32 chapters, all well illustrated. As an example of its scope we present a few of the headings: Piping Diagrams; Piping Systems; Live-Steam Drips; Blow-Off and Exhaust Piping; Air and Oiling Systems; Oil and Water-Purifying Systems; and Details, in separate chapters on live-steam, vacuum-exhaust, atmospheric exhaust, boiler feed, feed and fire-pump suction, heater-water supply, low-pressure water, condenser cooling-water, etc. It is a book of great practical value, and should be in the hands of every designer of steam-power plants, and it will prove suggestive in the direction of improvement for operating plants.

ESTADISTICA MINERA DE CHILE, 1906-07. Vol. III. Large 8vo. Pp. 518. Ill., Index. Prepared for the Chilean Government by the Sociedad Nacional de Minería, under the direction of Guillermo Yunge. Santiago de Chile, 1909.

This work is of greater value than any preceding volume, and practically sets out as if those did not exist. It is the most comprehensive statement available concerning the minerals and geology of the Chilean Republic. It gives a resumé of the topographic and geologic features of the country, the climate and productions, ports and means of communication to interior points, mail and telegraphic service, and the mining law. It then deals in detail with special products in separate chapters, one being given to coal, another to natural salts, and one to guanos and sul-

phur. The book contains 24 chapters in all, and it will suffice to point out that excellent descriptions in great detail, are presented of the gold occurrences and their exploration, of silver, copper, manganese, cobalt, lead, and others, together with an account of the geology of the districts referred to. There is an account of petroleum occurrences, and of borates. Special chapters, well illustrated, deal with the Braden Copper Co., and the great iron and steel works being installed by Schneider & Co. at Corral, under the title Cia. Siderúrgica Francesa. There is also an admirable summary of what is known of the mineral deposits of the Territorio de Magallanes, a region that is attracting world-wide interest because of its gold, copper, and coal. An important chapter is one by Lorenzo Sundt, entitled 'The Present State of Knowledge Concerning the Geology of Chile'. The book is excellently written and well gotten up, and will be of great value to anyone interested in Chile, who can read Spanish.

GAS-ENGINE THEORY AND DESIGN. By A. C. Mehrtens. Large 12mo., pp. 261. Ill., Index. John Wiley & Sons, New York. 1909. Price \$2.50.

The gas-engine is so rapidly taking a leading position as a prime mover, not only for small units, but for power-generation on a large scale, that every work on the subject is of interest; every book offers new hints which are helpful and suggestive. The volume now presented by Mr. Mehrtens is particularly well done, and should prove of great value to all students of gas-engine construction. More than this, no user of gas-engines can fail to better equip himself for the management of such machines by studying the problems involved in their design. The book is elementary but scientific, presupposing a knowledge of elementary mechanics. The work is accompanied with a valuable set of reference tables, covering physical properties of materials, petroleum distillates, properties of fuel gases, volumes and specific heats of gases, efficiencies at different altitudes, heat and power-units, and volume, pressure, and temperature curves.

STRENGTH OF MATERIAL. AN ELEMENTARY STUDY PREPARED FOR THE USE OF MIDSHIPMEN AT THE UNITED STATES NAVAL ACADEMY. By H. E. Smith. 2d. Ed., revised. Small 8vo. Pp. 170; Ill. John Wiley & Sons, New York. 1909. Price \$1.25.

The neat presentation of the elements of the study of strength of materials made in this volume is well known. The fact that it was designed for use at the Naval Academy does not imply that its leaning is toward naval construction. The author might properly have omitted mention of its specific purpose, which has nothing to do with the matter included. It is simply a brief review of the subject, for engineering students who have had the calculus.

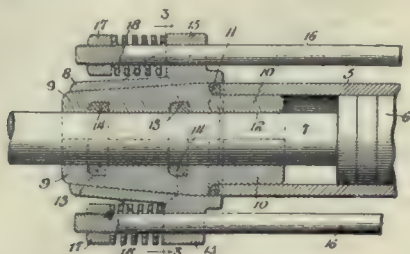
NINTH ANNUAL REPORT OF THE STATE GEOLOGIST [Michigan]. By Alfred C. Lane. Pp. 28. Lansing, 1908.

This, the administrative report for 1907, contains a general account of the work of the Survey and is accompanied by separate reports on 'Foundry Sands' by Heinrich Reis and J. A. Rosen; 'Summary of the Surface Geology of Michigan', by A. C. Lane; and a 'Biological Survey of Walnut Lake', by T. L. Hankinson.

THE TOTAL production of coal in the United States in 1908, according to the statement just issued by E. W. Parker, of the United States Geological Survey, was 415,842,698 short tons, having a spot value of \$532,314,117. In 1907, which was the record year, the production amounted to 480,363,424 short tons, valued at \$614,798,898. The total production in 1908, it will be seen, decreased 64,520,726 short tons, or 13.43% in quantity, and \$82,484,781, or 13.42% in value. The production of bituminous coal in 1908 amounted to 332,573,944 short tons with a value of \$374,135,262. In 1907, the production of bituminous amounted to 394,759,112 short tons valued at \$451,214,842. The anthracite production in 1908 reached 74,347,102 long tons, with a spot value of \$158,178,849. In 1907 the anthracite production amounted to 76,432,421 long tons valued at \$163,584,056.

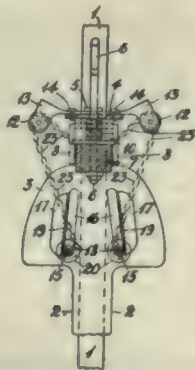
MINING AND METALLURGICAL PATENTS.

DRILLING-MACHINE.—No. 917,484. James Petrie, Ross-land, British Columbia.



In mechanism of the character described, the combination with a cylinder, of a reciprocatory piston operating therein and having a piston rod projecting from one end, a bushing surrounding the projecting portion of the rod and closing the end of the cylinder, said bushing comprising separate longitudinal sections having a plurality of annular packing-receiving grooves on its interior face, the exterior face of the bushing being continuous, unbroken, and uniformly tapered from its point of largest diameter to its outer end, said point of greatest diameter being located adjacent to the cylinder, a shell surrounding the bushing and having a continuously and uniformly tapered bore corresponding to the taper of the bushing and receiving the same, and resilient means entirely out of engagement with the bushing acting to continuously force the shell inwardly toward the cylinder to force the sections of the bushing together and to hold the bushing in place on the end of the cylinder.

SAFETY-CATCH FOR MINE SKIPS AND CAGES, HOISTS, AND THE LIKE.—No. 917,332. Victor H. Malston, Johannesburg, Transvaal.



In a safety catch for hoisting apparatus, the combination with the vehicle and guides thereof of a pair of shafts revoluble in converging guiding slots in the sides of the vehicle, friction rollers on the ends of the shafts for engaging the sides of the guides, converging racks fixed to the vehicle, and pinions on the ends of the shafts engaging the racks, a member by which the vehicle is supported and flexible connections between said member and the afore-said shafts, as set forth.

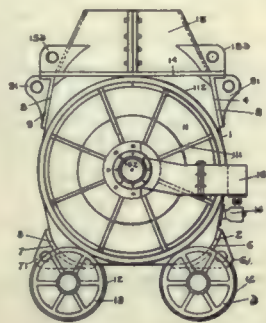
METALLURGY OF STEEL.—No. 918,382. William S. Simpson and Howard Oviatt, London, England.

An improvement in the art of manufacturing steel directly from ore which consists in associating a suitable percentage of finely ground graphite with the ore in a fine state of division and adding thereto a reducing carbonaceous substance containing water, and then heating the ore charge thus prepared to effect its reduction and the carburization of the metal.

A process of manufacturing steel which consists in preparing an ore charge containing a carburizing carbon, a reducing carbo-hydrate, and a suitable percentage of manganese dioxide and a fluxing material suitable to produce a liquid slag, all in a fine state of division and intimately

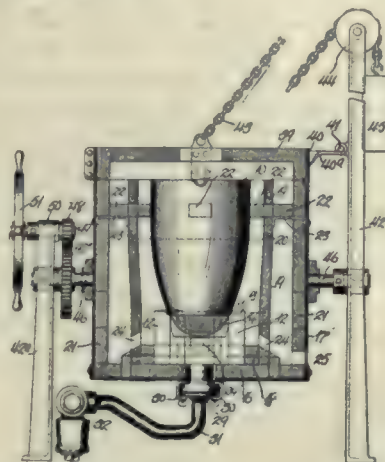
mixed, and then heating the ore charge thus prepared to reduce it and to purify and carburize the metal.

COPPER-CONVERTER.—No. 919,199. Frank E. Marcy, Salt Lake City, Utah.



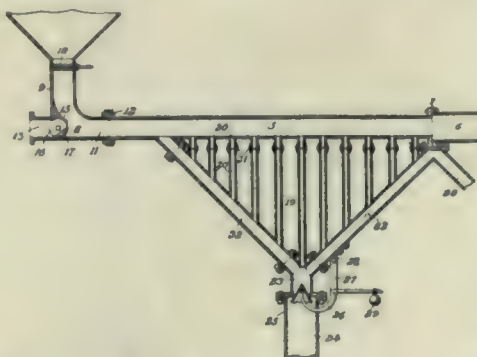
In a converter the combination of a cylindrical drum, an end of said drum provided with a continuous tread to permit complete inversion of the converter, the tread being of a diameter at least equal to the smallest diameter of said cylinder, friction wheels coacting with the tread for supporting the converter, and a top secured to the drum in a plane free from intersection with the tread.

MELTING-FURNACE.—No. 918,150. James E. Hewitt, Newark, New Jersey.



A melting-furnace comprising a shell, an inner combustion chamber separated from the shell by an air space, and a crucible supporting hollow block in the chamber bottom, said block having a seat to support a crucible, side openings, and convex top walls arranged to deflect the fuel and products of combustion to the said openings.

ORE-SEPARATOR.—No. 919,246. Elmer A. Ross, Ticonderoga, New York.



In a separator of the character described, the combination with an elongated classifying conduit having a plurality of sections, each adapted to collect a separate grade and each provided with discharge means comprising pipes converging downwardly into a single conduit, secondary discharge pipes connecting the classifying conduit and the converging pipes, and means for forcing fluid and suspended solids through the classifying conduit.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

CONTRACT TO CONVEY MINING CLAIMS—CONSTRUCTION.

A contract to convey certain specified placer mining grounds, described as part patented and part mineral entries for which receiver's receipts had been issued, "patent not yet issued, but to be issued," and the vendee was afterward put in possession in accordance with the contract. Such contract was construed to be one to convey such title to the several claims, legal or equitable, as the seller then had, and that this was fully understood by the parties to the contract. The words "patent not yet issued, but to be issued," were construed to be merely descriptive and not to be words of covenant and did not bind the seller to convey a patent title. The fact that patents for such unpatented claims had not been issued at the time the purchaser was to make final payment and receive the deed did not afford ground for rescission by him.

Nelson v. Wood Placer Mining Co., 167 Federal 206, Nov. '08.

MONOPOLIES—COMBINATIONS BY MINING CORPORATIONS.

A Michigan mining corporation engaged in mining and refining copper wholly within that State, by purchasing stock and obtaining proxies from other stockholders secured a voting control of a majority of the stock of a similar corporation operating adjoining mines. The purchasing corporation proposed to use such control to place in its directory a majority from its own board of directors. It was held to have the right to do this under the laws of the State, and it did not directly or necessarily affect interstate or foreign commerce and that such control was not of itself illegal as a condition in restraint of trade in violation of the Sherman Anti-Trust Act, especially in the absence of proof of an unlawful intent to so use its power as to bring about the prohibited restraint or monopoly and not in a lawful way to use it in an economical management of both companies.

Bigelow v. Calumet & Hecla M. Co., 167 Federal 704, 721, Oct. '08.

OIL LEASE—RIGHTS OF LESSOR.

In an action to recover land from trespassers who had drilled oil wells thereon and for an accounting for oil taken, where it is shown that such trespassers had gone into possession under a void assignment of a lease executed by the complainant and had expended large sums of money in a mistaken belief that they had a lawful right to enter upon such land and drill the wells, they were not required to account for the full value of the oil taken after it was produced, but only for its value in the ground as measured by the royalty complainant was to receive under the lease.

Turner v. Seep, 167 Federal 646, Feb. '09.

OIL AND GAS LEASE ON INDIAN LANDS—ASSIGNMENT.

An oil and gas lease executed by an Indian in the Indian Territory on a form prescribed by the Interior Department expressly provided that no sub-lease or assignment of any interest therein should be made without the written consent of the lessor and the Secretary of the Interior, and any such attempted assignment or transfer without such consent should be void. A subsequent regulation of the Interior Department which contained no requirements of the consent of the lessor in such case was not sufficient to validate a prior assignment of such a lease made without the lessor's consent.

Turner v. Seep, 167 Federal 646, Feb. '09.

POSSESSION OF MINING CLAIM—PRESUMPTION AND BURDEN OF PROOF.

The owner in fee of a patented lode mining claim is presumed to be in possession of the surface included in the lines of the location, and the burden of proving the contrary rests upon one claiming any part thereof by adverse possession.

Original Consol M. Co. v. Abbott, 167 Federal 681, Aug. '08.

Exhaust Steam Low-Pressure Turbines.

That the economies possible in the use of low-pressure turbines are not confined to the highly efficient power plants of the East, is apparent in the contract recently placed by the Potlatch Lumber Co. for a 600-kw. Westinghouse exhaust steam-turbine to be installed in the company's central power-plant at Potlatch, Idaho. There are at present placed in this plant one rope-driven Corliss engine and a 100-kw. high-speed triple engine, driving a generator. The low-pressure turbine will take steam at about 15 lb. absolute from both these units, and some other auxiliaries generating power. Arrangements have also been made for the operation of this unit for lighting for the mill and the surrounding town. The equipment ordered also includes a Westinghouse Leblanc condenser, designed for carrying a 20-in. vacuum. At the Potlatch plant refuse from the saw-mill is used entirely for fuel at practically no cost. It is thus apparent that the capacity of the plant has been greatly increased with practically no cost except the charges on the low-pressure turbine installation. This feature of exhaust-turbine work is being rapidly appreciated by managers of power-plants in every line of industry, resulting in a number of orders for equipments of this character.

German Copper Statistics.

L. Vogelstein & Co., of New York, give the following figures of German consumption of foreign copper for the months January to June 1909:

| | Tons. |
|-------------------------|--------|
| Imports of copper | 80,061 |
| Exports of copper | 3,913 |

Consumption of copper..... 76,148

as compared with consumption during the same period in 1908 of 79,090 tons. Of the above quantity 73,416 tons were imported from the United States.

Commercial Paragraphs.

THE C. O. BARTLETT & SNOW Co., Cleveland, Ohio, advises that it has lately received an order from the Philadelphia & Reading Coal & Iron Co., for a Greene self-dumping car-haul to be installed at the Burnside colliery.

THE KEYSTONE PLACER DRILL Co., Beaver Falls, Pennsylvania, has furnished to the City of Nappanee, Indiana, a double-stroke geared pump, doubling the capacity of the municipal water-supply plant. The same company also had the contract for boring the well in which the pump was hung.

Catalogues Received.

THE J. GEO. LEYNER ENGINEERING WORKS Co., Littleton, Colorado, in its Bulletin 1008 lists and describes the complete line of drill-sharpening machines manufactured by that company.

THE D. D. DEMAREST Co., San Francisco, has just published an interesting circular on the subject of Cornish pumps. It is worth reading by anyone who is at all interested in pumping.

AN ILLUSTRATION of record-time execution of a rush order for head-gate equipment required by the Anaconda Copper Mining Co. was given by the Dodge Manufacturing Co., Mishawaka, Ind. There were 13 units of head-gates, with frames and geared operating mechanism. The head-gates and frames, 40 ft. long, were of structural steel and weighed a total of 75 tons. The operating mechanism was of cast-iron framing, with cast gears, making an aggregate of 150 tons. The contract was taken April 3, '09, guaranteeing shipment in four weeks. Drawings and specifications were furnished by the Anaconda engineers. Patterns had to be made for the castings, which were special. This work was done, castings made, and the assembling well under way on April 14. The entire job was shipped to Montana April 23, thus making delivery in 20 days, or eight days less than the contract-time.

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TABLE OF CONTENTS.

| | |
|--|---------------------|
| EDITORIAL: | Page. |
| Notes | 305 |
| Taxing Unoperated Mineral Land..... | 306 |
| Smelter Fume and Equity | 306 |
| GENERAL MINING NEWS | 309 |
| SPECIAL CORRESPONDENCE | 314 |
| CONCENTRATES | 320 |
| DISCUSSION: | |
| Co-operative Topographic Surveys ..C. E. Sherman | 321 |
| Divergence of Plummet-Wires in Deep Shaft-Sur- veying | W. E. Downs 322 |
| Progress in Cyanidation | Alfred James 322 |
| Platinum and Gold Losses in Dredging..... | |
|Thos. H. Leggett | 323 |
| Waihi Gold Mines | Chas. Rhodes 323 |
| ARTICLES: | |
| Geology of Northeastern Mexico....R. H. Burrows | 324 |
| Blasting Deep Holes | O. H. Packer 328 |
| Accuracy in Assays and Analyses..Jas. W. Howson | 329 |
| Accuracy in Surveying | Lee Fraser 332 |
| Radium Ore | 332 |
| Impounding Mill Tailing | H. W. MacFarren 333 |
| Electrical Mine-Pumps in Europe...A. S. Atkinson | 334 |
| American Mining Congress | 336 |
| THE PROSPECTOR | 332 |
| DECISIONS RELATING TO MINING | 336 |
| DEPARTMENTS: | |
| Personal | 308 |
| Market Reports | 308 |

EDITORIAL.

WHILE nothing is certain until it is done, we are disposed to alter an opinion expressed editorially last week concerning changes in the new Mexican mining law as passed by the Deputies. The indications that the statute as it stands will be confirmed by the Senate are so strong as to leave little doubt as to the result.

STYLE is opposed to haphazard. In technology, as in every department of human work, it is a matter of convenience to use recognized forms of expression; it leads to clearness and accuracy. To this end the MINING AND SCIENTIFIC PRESS has endeavored to crystallize out of varied usage a standard which should serve as a correct medium. It is pleasing to note that Messrs. W. A. Caldecott, Ralph Stokes, J. E. Thomas, and other members of the Chemical, Metallurgical & Mining Society of South Africa, in issuing a style-sheet for the forthcoming review of local Rand practice, have stipulated that the terms 'sand', 'slime', 'concentrate', 'residue', and 'tailing' should be used in the singular when a plural meaning is not distinctly involved, thus accepting the system which we have advocated and employed.

IT was not with any wish to defraud Messrs. W. W. Mein and W. K. Betty of credit that we attributed to Mr. W. A. Caldecott, some weeks ago, the honor of having proposed the crushing of Rand banket ore in cyanide solution. Mr. Caldecott will not begrudge this peacock feather. There is so much plumage of the royal bird passed around at Johannesburg that everyone seems decorated, and the Chemical, Metallurgical & Mining Society of South Africa keeps before the world the honors achieved by its elect. The function of a local organization in expanding the influence of a group of men, so that it becomes felt all round the world, was never better illustrated than by this Society. It is not the bigness and the richness of the Rand that has accomplished this result; it is because the Society as a body has taken a high position for severe critical discussion, and has not permitted the debates to be used for mere personal puffery.

AMERICAN participation in the Hankow-Sze-Chuen railroad loan was arranged through the tact and skill of the chargé d'affaires at Pekin, Mr. Henry P. Fletcher, who has thus displayed diplomatic qualities worthy of substantial recognition. The amount of the loan has been increased from \$27,500,000 to \$30,000,000, of which American bankers are privileged to subscribe for one-fourth, the other three-quarters being adjudged to English, French, and German capitalists. The settlement ar-

ranged by Mr. Fletcher carries with it equal opportunity for Americans to supply material of construction for both the Sze-Chuen and the Canton lines, together with the right to participation in all future loans. The opposition to American influence in China has been strong, perhaps quite as intense from England and France as from Germany, although the open hostility has been chiefly Teutonic. The strategic position of the United States with reference to China is such that ultimate dominance of the situation from a commercial standpoint seems inevitable. So it seemed to Europe, and hence the victory won by Mr. Fletcher was against severe odds that render it, and the man who achieved it, notable.

Taxing Unoperated Mineral Land.

Our Denver correspondent informs us that Mr. John F. Shafroth, the Governor of Colorado, will remove from office the assessor of Huerfano county for assessing as grazing land the areas controlled by coal companies outside of the portions actually involved in mining operations. If this step is taken because of illicit transactions between the assessor and the coal companies it is justifiable; otherwise it would seem to be drastic. The principle involved is not precisely that of taxing the unearned increment. No man can definitely affirm the amount of such unearned increment until a transfer of title occurs. Thus is seen the virtue of the laws prevailing in certain countries whereby real estate is not taxed directly, but an amount, usually five per cent of the purchase price, is taken when the property changes hands. A bill was presented at the last session of the British Parliament for covering the identical point which has disturbed Governor Shafroth in Colorado. A basis for adjustment of the tax was found so difficult to establish, and the burden it would entail was proved to be so onerous, that in spite of the urgent need of revenue, the project was abandoned. Taxation is essentially a contribution out of earnings. Incidentally it serves as a deterrent to the locking up of resources; but manifestly the simultaneous utilization of the great reserves of mineral deposits is impossible. These are held in trust for future generations. The ascertainment of their extent and richness, and their control by effective working organizations, is a distinct contribution to the welfare of the future. It permits systematic exploitation along economic lines, and thus leads away from wasteful methods. To tax such inactive resources is not unlike an attempt to levy a tax upon the future. As our correspondent remarks, the questions involved may easily give rise to widely differing opinions. Undoubtedly it is an evasion of responsibility, even when honestly done, to assess coal-areas as grazing land. The case illustrates the need of determining an equitable procedure in these matters. What applies in the case which has arisen in Huerfano county is equally applicable to large deposits of metallic ores. It comes into prominence in connection with the vast low-grade copper deposits which are being developed with startling rapidity in the West. Eleven companies have over 250 million tons of ore proved, containing a recoverable copper content of

10 billion pounds. This is as much as the whole United States would produce at the present rate of output in nearly twelve years. Manifestly this reserve will furnish a basis for mining for many decades. Who can say what the actual value of these reserves would be today? In order to answer such a question one must know the cost of mining and reduction, and the market price, in the distant future.

Smelter Fume and Equity.

When a smelters' paradise is established it will have to be in a land too desert to support a farmer—something dryer than now exists within these United States. The ever recurring difficulty over fume has now become serious in Shasta county, California, and war is imminent. At least diplomatic relations have been severed, and the Farmers' Protective Association has issued an ultimatum. A committee was recently appointed to confer with the smelters, and on the strength of a report submitted to the organization at its meeting in Anderson the other day it was "Resolved: that the Shasta County Farmers' Protective Association does hereby absolutely demand that the infliction of damages by smelter smoke and fumes must cease; and that said smelters be at once sent a copy of this resolution with the demand that on or before October 1, next, some tangible proof shall be submitted to this Association that immediate steps are to be taken to stop said fume and smoke nuisance." That is sufficiently mandatory. It would have been interesting at the same time to have had expert advice as to means for complying with the demand. It is physically possible to abate the smelter-fume difficulty, but it has not yet proved economically possible to do it. The smelters are open to negotiation with anyone who can produce an efficient remedy, and efficiency involves financial feasibility. Lawsuits do not attract the owners of smelting works; they trench heavily upon and absorb profits; and relief through any adequate technical process would be most welcome. Many kinds of apparatus have been invented to cure the evil, but the fundamental principles which can be applied are few. These fall under four heads: the cooling of the gases to a point which will cause the condensation of the sulphuric anhydride (SO_3); the elimination of the SO_3 by washing with water; the precipitation of this substance by the electric discharge; and neutralization. This all sounds simple, and the non-technical man might order instant relief by the application of one of these principles, and then wonder why it didn't work. It has taken a long time for Darius Green to achieve vindication. The only difficulty in flying was to obtain sufficient velocity with a sufficient spread of wing, but a couple of generations have passed since the verdant aviator came to grief; poor Langley died disappointed after all his splendid contributions to the physics of flight; and it was only a week or two ago that M. Blériot invaded England in a flying machine. It takes time to work out the problems that confront men, and until the solution comes we have to do the next best thing, which is to determine what is most desirable for the greater number. In the end utilitarianism rules. This is not a world of sentiment, but a world

to live in, and all cannot be happy in it at the same time, which we believe can be demonstrated from the monuments of Egypt, and from the somewhat violent justice of the code of Hammurabi. The greatest good for the greatest number has always determined the ultimate course of society, individualistic rights to the contrary notwithstanding. We are aware that certain decisions of the Federal Courts have recently sustained the right of the individual as against that of large corporations and the great number of people dependent upon them for a living. The most recent decision along this line was that of the Supreme Court of Arizona in the case of the Arizona Copper Company *v. Gillespie*, which affirmed the right of the individual, in opposition to the principle enunciated by Judge Hunt of Montana in *Bliss v. Anaconda Copper Mining Company*. At the time the Arizona decision was handed down we pointed out that the decision of the Supreme Court of the United States in a famous case (*New York City v. Pine*) seemed to establish an equitable basis which recognized both the right of the individual and that of the public. In effect that was the necessity of due diligence on the part of the individual. If he establishes himself in the track of possible damage which could have been foreseen, he has done so at his own risk: if he be already established it is his part to foresee possible well known perils from other industries that are proposed in his neighborhood, and it is his duty to protest; if due diligence has been observed and unforeseen damage result there is the usual remedy at law. Whether that should also involve an injunction is a question which would be determined by each judge, and no man can prophesy what would be his point of view. Ordinarily the preponderance of interest in terms of numbers would control. Preponderance of financial interest weighs less than that of the respective populations dependent upon the clashing industries. This seems to be equitable, and to satisfy the requirements of a rational utilitarianism which looks not toward any form of paternalism in government for a remedy. How far the people of Shasta county have considered these phases of the situation we are not informed. We think they may be leaning too heavily upon the principle which determined the decision of the Federal Court in the famous *débris* case of *Woodruff v. North Bloomfield Gravel Mining Company*. It is by no means certain that the temper of the courts would be found the same today. Our sympathies go out to the farmer as well as to the miner; and no one would more promptly call to account any corporation that was wilfully doing avoidable injury. But in this case, as in almost every other where this eternal fume-problem has become annoying, the farmer has been in a position to benefit more largely by the presence of the smelter than he could hope to do were the smelter driven away. For actual demonstrable injury sustained by reason of fume he can readily collect damages in court. So fully has this been recognized that it has been a regular procedure to assess and pay for such damages out of court. Furthermore it has become customary to ascertain the average damage caused over certain areas, and to commute this by cash payments on what are termed

'smoke-easements'. Thus may these difficulties be equitably adjusted if no attempt be made to over-reach and demand damages in such sums as might give rise to suspicion of blackmail.

Coming back to the technical difficulties in the case, we may point out that simple precipitation by cooling is not as easy as it looks. Sulphuric anhydride is evolved in considerable quantities in the roasting of any sulphides. This is the principal cause of damage. It is acrid, and corrosive. Uniting with water it forms sulphuric acid. The SO_3 itself is a white solid when condensed, but it begins to volatilize above a temperature of 59° Fahrenheit, and is completely volatile at 115° . These are low temperatures; too low in fact to give much motive-column for draft except in winter when the atmosphere outside of the chimney would be cold. In other words, mere length of flue is not enough, particularly in hot weather. Even if it were feasible to so cool the gases as to eliminate the SO_3 , the decrease of temperature would reduce the natural draft to such an extent as to require the application of power to move the flue-gases, and at once the economic element enters and baffles attempts to solve the problem in that manner.

Elimination of the SO_3 by water is also mechanically feasible, if done regardless of expense. Spraying, which looks so easy, has practically failed. It has been tried by our fathers and grandfathers for generations, and human ingenuity has exhausted every means to render it effective. Passing gas through water does not wash it. If anyone doubts that fact let him add more, for his personal edification, to the big sums that have been expended to reach that conclusion. A tower filled with coke, or broken rock of certain kinds, through which water trickles, will afford sufficient contact between the gases and the water to wash out soluble compounds. This, however, introduces enormous frictional resistance, reduces the temperature, and necessitates the application of power to move the gases. It comes back to a question of the thing that is economically possible. Electric precipitation has not yet been demonstrated successfully on a scale of such magnitude as to cope with the enormous volumes of gases issuing from large roasting furnaces. This is the Cottrell process, which may become the solution of the problem. Mr. F. G. Cottrell admitted his inability to adapt it in its present state to the conditions at Anaconda, Montana, as Mr. E. P. Mathewson testified some time ago before Judge Hunt. Neutralization of fume with volatilized zinc oxide has been applied by Mr. George W. Heintz at Bingham Junction with such success as to obtain a court decree permitting the smelter of the United States Smelting, Refining & Mining Company to operate. The adaptability of this system to general conditions, however, is not proved, and it is unsafe to argue too far from this isolated example. There is a heavy burden of proof devolving on the Shasta farmers to show that the smelters can obey their mandate without financial ruin. We commend once more to all concerned a careful consideration of the high principle of justice and equity involved in the decision in the case of *New York City v. Pine*.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

H. F. MARRIOTT is in Canada.
CHARLES BUTTERS is at Carlsbad.
R. B. MORTON has been in Denver.
J. H. CURLE went to Norway recently.
GEORGE OTIS SMITH was in San Francisco.
W. E. DEFTY has gone to Phoenix, Arizona.
H. FOSTER BAIN was at Central City, Colorado.
HENRY F. COLLINS is examining mines in Spain.
H. A. TITCOMB is on his way to western Siberia.
JAMES F. CALLEBREATH has been in San Francisco.
THOMAS H. LEGGETT was at Sutton Island, Maine.
R. H. BURBOWS has returned to Guanajuato, Mexico.
CHAS. T. LYSER has returned to Berkeley from Chloride.
ARTHUR K. ADAMS has removed to Santa Fé, New Mexico.
C. A. BRYANT has gone from Eagle, Alaska, to Kallispell, Montana.
J. W. FINCH has returned to Denver from Butte and the Couer d'Alene.
W. H. STORMS has returned from San Francisco to Sutter Creek, California.
DAVID MCCLUBE, Jr., is returning to California from a holiday in Europe.
LEWIS T. WRIGHT is expected in San Francisco on his return from London.
GEO. J. YOUNG, of the Mackay Mining School, Reno, Nev., was in San Francisco.
GARDNER F. WILLIAMS, who now lives at Washington, is on a visit to South Africa.
R. A. F. PENROSE has left San Francisco for Philadelphia, visiting Denver on the way.
ERNEST R. WOAKES is taking a holiday in London; he will return shortly to Linares, Spain.
J. E. THOMAS, of the Simmer & Jack, has been in London and is returning to Johannesburg.
ROBERT LINTON has returned to Los Angeles after examining iron properties in eastern Texas.
HOOPER & SPEAK, of London, have been appointed consulting engineers to the Famatina mine, Argentina.
GEORGE A. TWEEDY passed through San Francisco. He will visit New York before returning to Rosario, Sinaloa.
W. J. ADAMS has been examining the property of the Ruth Pierce Mining Co., at Horinotos, Mariposa county, California.
L. S. GRISWOLD, of the Missouri School of Mines, has been visiting Nevada and California. He is now in Clear Creek county, Colorado.
HORACE V. WINCHELL was among the passengers rescued from the wrecked S. S. *Ohio*, on August 26. He is on a journey to Alaska.
W. K. BETTY, of Messrs. Eckstein's metallurgical department, is visiting some of the chief gold-mining centres of the western United States.

The best manner of introducing hydraulic machinery into the Mexican market, according to Consul Thomas W. Voetter, of Saltillo, is by the maintenance of a representative in Mexico who will travel from place to place. By careful reading of the press, and from news which an able man would receive from acquaintances, a representative would learn of enough new enterprises in Mexico to keep him busy looking after them. If the home office should consider the expense of maintaining such a representative too great, it might join forces with one or two other firms which have allied lines, but not competing ones, so that the expenses of the joint representative could be divided. One good contract landed will pay the expenses of a good man for a long time, and one installation satisfactorily completed will be a good advertisement for another. Many foreign firms maintain agencies in the City of Mexico,

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, September 2.

| | | | |
|---------------------|------------|---------------------|-------------|
| Antimony | 12-12½c | Quicksilver (flask) | 43.50-44.50 |
| Electrolytic Copper | 16¼-16½c | Spelter | 8½-7½c |
| Pig Lead | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver per oz |
|---------|----------------------|-------|----------|---------------|
| Aug. 27 | 13.00 | 4.26 | 5.77 | 51½ |
| " 28 | 13.00 | 4.26 | 5.77 | 51½ |
| " 29 | Sunday. No market. | | | |
| " 30 | 13.00 | 4.26 | 5.77 | 51½ |
| " 31 | 13.00 | 4.23 | 5.76 | 52 |
| Sept. 1 | 13.00 | 4.23 | 5.76 | 51¾ |
| " 2 | 13.00 | 4.23 | 5.76 | 51¾ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Aug. 26. | Sept. 2. |
|-------------------|----------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird | 1 5 6 | 1 7 6 |
| El Oro | 1 5 6 | 1 6 0 |
| Esperanza | 2 19 4½ | 3 0 0 |
| Dolores | 1 10 0 | 1 10 0 |
| Oroville Dredging | 0 12 6 | 0 12 6 |
| Mexico Mines | 6 5 6 | 6 6 3 |
| Tomboy | 1 1 3 | 1 1 3 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

Closing Prices.

| | Aug. 26. | Sept. 2. |
|--------------------------------------|--------------------------------|--------------------------------|
| Amalgamated Copper..... | 82 ⁷ / ₈ | 84 ¹ / ₂ |
| American Smelting & Refining Co..... | 99 | 99 ¹ / ₂ |
| Boston Copper..... | 15 ⁵ / ₈ | 14 ¹ / ₂ |
| Butte Coalition..... | 26 | 25 ¹ / ₂ |
| Cumberland-Ely..... | 71 ¹ / ₈ | 71 ¹ / ₈ |
| Dolores..... | 6 | 6 |
| El Rayo..... | 2 ¹ / ₂ | 2 ¹ / ₂ |
| Giroux..... | 9 ³ / ₈ | 9 ³ / ₈ |
| Greene-Cananea..... | 9 ¹ / ₂ | 9 ³ / ₈ |
| Indiana Sonora..... | 2 ⁷ / ₈ | 3 |
| La Rose..... | 8 | 8 |
| Miami Copper..... | 16 ¹ / ₂ | 16 ¹ / ₂ |
| Nevada Consolidated..... | 24 ³ / ₈ | 24 ⁷ / ₈ |
| Newhouse..... | 3 ³ / ₈ | 3 ³ / ₈ |
| Nipissing..... | 10 ³ / ₈ | 10 ³ / ₈ |
| Ohio Copper..... | 4 ⁷ / ₈ | 4 ³ / ₈ |
| Tennessee Copper..... | 37 | 37 ¹ / ₂ |
| Utah Copper..... | 50 ¹ / ₂ | 50 ¹ / ₂ |
| Yukon..... | 5 ³ / ₈ | 5 ³ / ₈ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

September 2.

| | | | |
|----------------------|------|----------------------|-----|
| Adventure | 6¼ | Mohawk | 62 |
| Allouez | 49½ | North Butte | 61 |
| Atlantic | 10½ | Old Dominion | 67 |
| Calumet & Arizona | 106½ | Osceola | 144 |
| Calumet & Hecla | 685 | Parrot | 32½ |
| Centennial | 41½ | Santa Fe | 2½ |
| Copper Range | 83 | Shannon | 16 |
| Daly-West | 8 | Superior & Pittsburg | 16 |
| Franklin | 16 | Tamarack | 71 |
| Granby | 99 | Trinity | 12½ |
| Greene-Cananea, ctf. | 9½ | Utah Con | 44½ |
| Isle Royale | 28½ | Victoria | 3½ |
| La Salle | 15 | Winona | 53½ |
| Mass | 8¼ | Wolverine | 166 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 2.

| | | | |
|----------------------|-------|-----------------------|-------|
| Atlanta | \$ 16 | Mayflower | \$ 14 |
| Belmont | 85 | Midway | 21 |
| Booth | 15 | Montana Tonopah | 98 |
| Columbia Mtn | 11 | Nevada Hills | 70 |
| Combination Fraction | 74 | Ophir (Comstock) | 1.20 |
| Daisy | 17 | Pittsburg Silver Peak | 65 |
| Fairview Eagle | 15 | Rawhide Coalition | 27 |
| Florence | 3.05 | Rawhide Queen | 25 |
| Goldfield Con | 6.72 | Round Mountain | 70 |
| Gold Kewenas | 11 | Sandstorm | 10 |
| Great Bend | 7 | Silver Pick | 15 |
| Jim Butler | 15 | St. Ives | 10 |
| Jumbo Extension | 18 | Tonopah Extension | 63 |
| Llanos Con | — | Tonopah of Nevada | 7.00 |
| MacNamara | 32 | West End | 32 |

General Mining News.

ARIZONA.

COCHISE COUNTY.

The precipitating plant at the Copper Queen has been completed and the water turned through both upper and lower sets of troughs.—At a meeting of the stockholders of the Bisbee-Arizona Mining Co., it was decided to increase the stock from 1,000,000 to 2,000,000 shares.—The heavy motor for the new hoist in course of erection at the Irish Mag shaft of the Calumet & Arizona Mining Co. was hauled to the mine. The shaft is being retimbered and put in order for a new skip.

GILA COUNTY.

Hovland & Smith, of Duluth, have secured the control of the Black Warrior properties in the Globe district, for \$1,250,000, the largest part of which is cash, the rest bonds convertible into stock at par in the new company which is to be organized with a capital of \$2,500,000. The property is a producing one, shipping at present 100 tons of 10% copper ore per day. On a portion of the property an orebody has been opened for a distance of 700 ft., which is from 40 to 60 ft. wide, and explored to a depth of 150 ft. A narrow-gauge railroad connects the mine to the Warrior townsite and it is expected the Southern Pacific will build a spur to connect with the Miami line.—The Joe Bush shaft of the Inspiration company is down 385 ft., and from the 90-ft. point has been in ore that will average 3% copper. There are over 1600 tons of ore on the dump from this work. Of the nine drill-holes sunk on the property, all have cut ore that will average more than 3%.—At the Superior & Boston a force of 70 men is at work. The new hoist and compressor have been set up and a boiler-house and dry-room is in course of construction. The management expects to commence shipping ore about October 1.—The Arizona Commercial Copper Co. is to blow in its new plant the last of this month, and has advertised for bids to construct a number of cottages for its employees.—At the Arizona-Michigan cross-cuts are being driven to the veins on the 500-ft. level. N. A. Nelson is superintendent.—There are 25 men working on the Live Oak property driving a drift on the third level, and running cross-cuts into the ore. The east drift is in 80 ft., with a cross-cut 80 ft. in ore that averages 2½% copper.—A 15-ft. cross-cut from the 60-ft. level of the McEwen & Davidson group opened 2½ ft. of copper glance. Twenty tons of this material has been taken out for shipment to the Old Dominion smelter.—The upper adit of the Rye Copper Co., 16 miles from Payson, has opened a small body of copper ore. A lower adit, now in 325 ft., is being driven to cut the same vein at depth. It will require about 1000 ft. additional work for this to intersect the vein. H. S. Duncan is superintendent.

MARICOPA COUNTY.

Elliott & Drescher, of Prescott, have a contract to install a 5-ft. Huntington mill on the property of the Sunnyside Mining Co. in the Hassayampa district.

YAVAPAI COUNTY.

A syndicate has been formed to take over the Gold Note mine of A. D. Cupples, southwest of Congress. There is a 3-stamp mill on the property and the company plans to enlarge this and install heavier machinery at the mine.—A Butters filter is being installed in the plant at the Alvarado mine. A large amount of \$12 ore is blocked out in the upper levels and the same vein has just been opened at the 900-ft. level. E. W. Duffree is superintendent.—The Yarnell mine, 5 miles from Congress Junction, is to be re-opened and a new mill erected.—The Rincon mine is to be re-opened this fall.

The differences of the stockholders of the Stanton-Rich Hill Mining Co., at Stanton, have been adjusted and work at the mine is to be resumed shortly.—D. J. Sayer, of Denver, is to resume operations at the Churchill mine near Stanton.—The La Gracia Gold & Copper Mining Co. has commenced development work at its Red Bluff group 6

miles from Dewey. Samples from the property have assayed 20% copper, 8% cobalt, with some nickel, arsenic, and antimony. T. C. Jordan is manager.

CALIFORNIA.

AMADOR COUNTY.

The South Eureka Mining Co. is to install 20 additional stamps in its mill near Sutter Creek. The South Eureka company has been tramming a large portion of its ore to the Central Eureka mill having leased 20 stamps there.—Two new cables have been put on the reels at the Keystone mine that will enable the company to sink 600 ft. deeper. The foundation of the head-frame at the Oatton shaft has been strengthened and 20 stamps in the mill put in good condition. The company is grading for an addition to the mill that will contain 80 stamps. When this is completed the old mill will be dismantled and the old stamps replaced by heavier ones.—Webb Smith, superintendent of the Kennedy mine, and associates, are to prospect the Orr property north of Plymouth.—The mill at the Original Amador will be completed in a short time.

BUTTE COUNTY.

The Leggett No. 3 dredge has been completely dismantled and the machinery placed in a new boat which is now working on the Hulse and Savage properties near Palmero.

LOS ANGELES COUNTY.

On Friday afternoon, August 17, an informal reception was tendered by the members of the Los Angeles Chamber of Mines, to members of the Arizona Hassayampa Club, of Los Angeles, the Montezuma Club, of Goldfield, and the Sierra Madre Club, of Los Angeles, and to visitors generally from the mining districts of the Southwest and Old Mexico. An address of welcome to the visitors from the various mineral districts was tendered by Calvert Wilson, the president of the Chamber.

MARIPOSA COUNTY.

McClure Gregory is preparing to re-open the Tyro mine near Coulterville. The old shaft opened a 6-ft. vein at a depth of 650 ft., and drifts were run along this over 300 ft. There is a 10-stamp mill on the property which will be started at an early date.—Lessees of the Long Mary mine have started the mill on that property.

NEVADA COUNTY.

A. L. Shinn and C. L. Wilson have taken a bond on the McKinlay and Golden Slipper groups near Moore's Flat.—Ten additional stamps are to be started in the Idaho-Maryland mill shortly.

PLACER COUNTY.

A new adit has been started on the Hidden Treasure property. Harold Power is in charge of the work.—The Dewey claim has been bonded by a Denver firm which let a contract to drive the adit 100 ft. It will require 350 ft. additional work to cut the vein with this adit and the ore will be opened at a depth of 200 ft. W. R. Grant will have charge of the work.—The adit on the property of N. E. Davenport has cut the contact and opened some good ore.

PLUMAS COUNTY.

J. N. Turner, operating a lease on a portion of the Johnson-Graham mine, formerly known as the Plumas Eureka, has opened a shoot of ore that averages 3 ft. wide and assays from \$27 to \$104 per ton. The mine is within three miles of the Western Pacific's tracks, and is credited with a past production of \$15,000,000.

SAN BERNARDINO COUNTY.

The Foster Brothers and Patrick McCluskey have made arrangements with the Hart Townsite company to supply the necessary amount of water for the mill which they are to erect. A shaft is to be sunk on the high-grade ore recently discovered in an open-cut and a connection made with the 100-ft. level.—Operations are to be resumed at the Florence property in Hart this month. There is a large body of low-grade ore blocked out on the 180-ft. level, and it is understood that the company is to install a hoisting plant and erect a mill. J. C. Popper is manager.

SHASTA COUNTY.

The Western Exploitation Co. is installing an 18-hp. hoist at the Milkmaid mine in French Gulch.—At a meeting of the Farmers' Protective Association in Anderson, the committee appointed to interview the managers of the smelters reported that those officials would promise nothing definite. The Association, therefore, adopted the following resolution: "Resolved, That the Shasta County Farmers' Protective Association do hereby absolutely demand that the infliction of damages by smelter smoke and fumes must cease. And that said smelters be at once sent a copy of this resolution with the demand that on or before October 1, next, some tangible proof shall be submitted to this Association that immediate steps are to be taken to stop said fume and smoke nuisance."

SIERRA COUNTY.

(Special Correspondence).—The Kate Hardy has cut a shoot of ore running \$100 to \$5000 per ton. San Francisco people are interested.—The Oakland mine has uncovered a stringer of rich ore. The lower adit is expected to cut the vein at a depth of 350 ft.—A 6-ft. vein of milling ore is reported from the adit of the Slate-Castle-Jaffa group.—A raise will be driven from the adit of the South Fork mine to tap the channel traversing the South Fork and Maple Grove holdings.—The Acme Mining Co. is driving an adit to open its property. The vein has been cross-cut 35 ft. It is understood that a mill will be erected this fall.—W. T. Forsman, of Sacramento, has bonded the holdings of Foster & Squires for \$10,000, and has commenced active work.—At the Bellevue 35 men are working and good gravel is being extracted. London capitalists are interested.—The adit at the Gladstone is in 150 ft., and is expected to intersect two veins within a few weeks. Some good ore is being opened at a short distance from the portal of the adit. C. M. Root is superintendent.—At the Pacific, Wingfield & Nixon, of Goldfield, have 10 men at work driving the adit and running a drift from the adit to intersect the old channel under Fillmore ridge.—Several discoveries have been made on numerous small properties near Gibsonville in the past week.—The Sixteen-to-One and Bonanza King mines remain idle, and there is little promise of an early settlement of the litigation.—The Rainbow mill is running on good ore. The main vein is about 30 in. of rich ore.—The Twenty-One vein is 10 in. wide, and considerable high-grade ore is being sacked.—Kellar and associates are developing a promising claim near Bowman's Dam.

Alleghany, September 1.

The Eclipse Mining Co. has driven a 140-ft. adit on its property near Gibsonville, and expects to cut the vein in a short distance. Surface work has opened a vein the length of the claims, and the company has ordered a 10-stamp mill for the property, which is held under a \$10,000 bond.

TRINITY COUNTY.

Wilson & Ehrmann have opened the ore-shoot in their lease at the Gifford mine, in Eastman gulch, for a distance of 50 ft., and have 25 tons of ore on the dump that will assay between \$300 and \$500 per ton.

TUOLUMNE COUNTY.

Charles H. Sergerstrom, of Sonora, has secured a bond on the Dutch mine, at Quartz, and is re-opening the property. A crew of men has been started repairing the 20-stamp mill and cleaning out the shaft. The mine has been under the management of the Dutch Mining Co. for the past 15 years, and has a record of producing \$2,000,000.—The O'Hara mine at Brown's Flat, has been bonded to T. C. Crawford, of London, for \$50,000. The agreement provides that the bonders commence active work the first of this month and expend at least \$1000 per month in development. J. F. O'Hara will have charge of the work.—George A. Richards has instituted suit against C. R. Watson, C. A. Fitzgerald, and John Doe Dunkinson, to recover an undivided one-third interest in the Alameda mine.—The Mack mill has been started on a 200-ton lot of ore from the Harper Brothers' mine.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Kennedy Gold Mining Co., operating the Centennial mine on Leavenworth mountain, is preparing to build a 50-ton stamp mill. The ore is worth from \$12 to \$14 per ton, in gold, silver, and copper. David Kennedy is manager.—A rich discovery has just been made at the Seven-Thirty mine, on Sherman mountain by W. P. Alkire & Co., who have opened a body of smelting ore that is from 8 to 12 in. wide. Assays run from 650 to 700 oz. silver per ton.—J. Bowen started operations this week on a group of claims in East Argentine. The adit is being cleaned out and retimbered preparatory to stoping on a streak of ore that is from 8 to 10 in. wide, and assays from 120 to 130 oz. silver per ton.—Shipments of smelting ore have been started from the Drummond mine, situated on Columbian mountain. During the last week a streak of smelting ore was exposed in the east drift that is from 18 in. to 2 ft. wide, and samples taken across the same, show average content of \$46 per ton silver and lead.—A new discovery is just reported from the Aetna vein of the Capital Mining & Milling Co. In extending the east drift a streak of smelting ore has been cut that is from 10 to 14 in. wide, and assays 18 oz. gold, 35 oz. silver, and 9% in copper. W. M. Cooper is manager.—The Highlander mine, situated in Virginia canyon, is being re-opened. The adit has been cleaned out and a drift started upon an 8-in. streak of ore that is worth from \$20 to \$22 per ton in gold.—The bond of \$6000 held by the Gold Quartz Mining Co. on the Klondyke group of claims at Alice, was lifted last week by W. A. Maxwell, the manager.—The Mineral Chief mine on Democrat mountain, owned by the Linn Con. Mining & Milling Co., has been placed upon a self-supporting basis and a net earning of \$3000 per month is being made. Of this sum \$1000 is being used each month to lift outstanding bonds, while the balance is being placed in the development fund. C. E. Pughe is manager.—O. Shaffer & Co., leasing on the 11th level of the Old Town, have one of the best paying propositions in the district. In ten days two men extracted \$2000 worth of ore. Georgetown, August 30.

DENVER COUNTY.

The Modern Smelting & Refining Co. is buying ore in Clear Creek and Gilpin counties for their plant at Utah Junction near Denver.

GILPIN COUNTY.

(Special Correspondence).—A contract has been let for building the D. N. W. & P. branch from the main line to Central City. This will be the first standard-gauge line into Gilpin county, and will afford competition in transportation. While a few miles longer than the present route by way of the C. & S., the new line has an advantage in grades and curvetures.—The Kansas vein has been cut in the Newhouse tunnel and shows some lead and iron sulphide with small amounts of gold and silver. The tunnel-head has recently been driven through the veins of the 'patch' near Nevadaville.

Central City, August 31.

LAKE COUNTY.

William S. Jones, operating the Robert E. Lee mine, on a lease, is arranging to ship the ore, which runs 25% zinc, to the smelter.

OURAY COUNTY.

The Mono Baltic Mining & Smelting Co. have purchased the machinery for its new plant at Ironton, and will commence grading shortly.—Operations have been resumed at the property of the Copper Gulch Mining Co. E. S. De Golyer is manager.

SAN JUAN COUNTY.

The Iowa-Tiger Leasing Co., of Silverton, paid its fourth dividend of 20%.—The mill of the Silverton Mining Co. has been started but was shut down temporarily owing to a shortage of cars. A large amount of ore has been blocked out in the mine and as soon as regular shipments can be started the stamps will be dropping again.—There are 30 of the 100 new stamps dropping in the new mill of the Gold Prince at Animas Forks.

SUMMIT COUNTY.

At the International mine, near Robinson, work has been started on the vein that was opened two years ago, and it is understood that the company is blocking out a large amount of good milling ore.—Ault & Wiborg are to start work at the Frisco mill on ore from the Excelsior mine.—A good body of ore has been opened in the property of the Bledsoe Mining Co., in the Kokomo district. The vein is 2 ft. wide, and is all shipping ore. H. Pomeroy is in charge of the work.—At the Gold Bird mine the 300-ft. adit opened a 12-ft. vein that assays 52% lead with some silver and gold. The property is owned by George Pomeroy and Frank Brown, of Leadville.—Franklin Luty is shipping good ore from the Mayflower mine which he is operating under lease.—William Lindsay is shipping ore from his lease on the Wintergreen mine. The ore is a heavy iron sulphide with a good gold content.—Louis Johnston has secured a lease on the Iron Mask mine and is now erecting a plant on the property.—The Union Consolidated, on Gold hill, is being re-opened.

Operations are to be resumed at the Birds Nest group.—The Reconstruction group on Copper mountain, has been leased to Peter W. Breene, who has a force of men at work cleaning out the old workings.—On the River-side group a 2-ft. vein of lead-copper ore has been opened.

TELLER COUNTY.

The cross-cut on the 200-ft. level of the Mountain Beauty mine, on Bull hill, opened a shoot of \$100 ore. This portion of the mine is under lease to Moore & Bower, of Victor.—Wilson & Hoy shipped 6 tons of ore from the dump of the Gold Coin mine to the Cripple Creek mills and received \$25 per ton in settlement. The lessees have a second shipment of 25 tons ready and this is to be forwarded to the Standard mill at Colorado City.—The August output of the Whitney & McMullen lease on the Vindicator approximated 100 tons.—In the Pride of Cripple Creek mine a shoot of rich ore has been opened on the 630-ft. level. The vein is from 10 to 12 ft. wide, and assays \$30 per ton.—A new 10-drill Franklin compressor has been set up at the Doctor-Jack Pot claim on Raven hill, and is now supplying the lessees with power.—In the quarterly report of the Gold Dollar Consolidated Mining Co., H. L. Sheperd, the manager, states that the company has \$9500 on hand after paying dividends and all outstanding obligations.—The Rexal Gold Mining Co. opened a 5-ft. vein on the 700-ft. level by a 150-ft. cross-cut from the shaft. Samples assay from \$40 to \$250 per ton. R. H. Brooks is superintendent.—The Jennie V. Leasing Co. has resumed operations on the Monte Cristo property.

IDAHO.

IDAHO COUNTY.

At the Blue Ribbon property, five miles east of Elk City, a 7-ft. vein was intersected by an open-cut near the portal of the main adit. There is over 1000 ft. of development work on the property.—A rich shoot of ore was opened recently by the drift at the Buckhorn mine in the Ten Mile district. The drift has been run 250 ft. on the vein and cross-cuts driven every 25 ft. showing the vein to have an average width of 20 feet.—On the Gilt Edge property a 30-ft. vein has been opened 6 ft. of which is good milling ore. A. D. Bennett and J. Grinde, the owners, expect the lower adit to cut the vein in a short time.—A cross-cut has just been completed at the Gold Bug mine and another contract let. The vein has been opened on the surface for 1200 ft., and samples taken from open-cuts assayed from \$4 to \$200 gold per ton.—Nathan Hass has bonded the Houston property on Santiam creek.

OWYHEE COUNTY.

On the dump of the Big Four group on Boulder creek, the owners of the claims have 100 tons of \$13 ore, and are blocking out a large amount of similar ore in the mine. On a test run the concentrate from this ore assayed \$456 per ton.—At the Bushranger group four adits have cross-cut the ore showing it to have an average value of \$20 per ton. There are 25 tons of ore on the dump for a milling test.—Several rich stringers of ore have been cut by the

mill-level adit on the Banner property.—The Silver City Mining & Milling Co., near Silver City, is installing electric plant at its mine and active work will be resumed in a few days.

ILLINOIS.

MARION COUNTY.

(Special Correspondence).—A new oilfield has been discovered near Sandoval, in the south-central part of the State. Three gas wells have been brought in and two oil wells, which average 100 bbl. each. Leases have gone to a premium.

Sandoval, August 25.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—Several mills are under construction in the Empire district where ore is being opened at a depth of 150 ft.—Capp & Hinkman are re-opening some old workings on the Kennedy ground and taking out 15% ore from the 30-ft. level.—Cook & Stone are re-opening the Black Hill lease at Galena. A large pumping plant has been installed and the owners are planning the erection of a large mill.—The Ihlsing Mining Co. is erecting a mill on the Ping and Robertson leases and is to sink a 5 by 15-ft. shaft 325 ft. This will be the deepest shaft in camp as no ore is new being mined below the 265-ft. level.

Galena, August 31.

MICHIGAN.

The Michigan Copper Mining Co. has just finished the third diamond-drill hole on its present series, which is exploring south of the Evergreen-Knowlton lodes, in the strike of the three new Adventure lodes, and the drill is now being rigged up for the fourth hole. This will be put down along the same strike, some distance west of the others.—The Challenge exploration of the St. Mary's Mineral Land Co. has discontinued all operations. This work has been in progress for several years. A shaft was sunk to a depth of 850 ft. and extensive cross-cutting, driving, and diamond-drilling carried on from several levels. The eastern or Jacobsville sandstone was drilled into for a considerable distance by diamond-drill, so that its identification was positive, and from there westward a thorough cross section of the geology was made for a distance of over 3000 ft., while several of the more promising amygdaloid beds were opened and the one identified as the Baltic lode was diamond-drilled on the incline of the formation to great depth, but nothing that offered encouragement for further investigation was discovered. The Challenge shaft is two miles south of the Globe shaft which was abandoned a few months ago, and three miles south of the Champion mine.—The Hancock Consolidated Mining Co. has levied an assessment of \$2 per share, payable one-half On October 10 of this year, and one-half in February next year. The management has started a survey for a railway to the property and is considering the preliminaries of the railway as well as a mill. The showing underground has been much better than was anticipated, although the work is being done on a lode which was not known to exist at that time.

MISSOURI.

NEWTON COUNTY.

(Special Correspondence).—The Hancock Mining Co. has opened a good prospect at a depth of 140 ft. where the ore is 7 ft. thick, and runs 10% zinc.—After a series of accidents the Shoal Creek Mining Co. is again producing a large amount of silicate ore which is being cleaned on hand-jigs.—Bankard & Scott have opened 44 ft. of rich ore in the southern part of the Spring City camp, samples from which assay as high as 50% zinc. A mill is to be constructed on the property.

Spring City, August 30.

NEVADA.

CLARK COUNTY.

The Memphis Mining & Milling Co. has secured the Weeks ground, near Searchlight, and is installing a power plant preparatory to sinking. A. L. Hill is manager.—

The Fraction shaft, on the Homestead property, is to be sunk from the 600 to the 1000-ft. level. A compressor and power drills have been ordered and will be shipped to the mine shortly. The mill has been shut down till the shaft is completed.—The Copper Prince mine, near Nelson, was purchased by William Hambly for a group of Colorado capitalists for \$10,000; \$3000 was paid on the first installment, the balance to be paid within 90 days. Picked samples from the vein assayed 26% copper, 15 oz. silver, and \$20 gold per ton.—The Philadelphia-Searchlight Mining Co. has purchased a diamond-drill and will explore its property from the 600-ft. level. The vein at this level is broken and full of wall-rock, and the company hopes to cut the vein at some more solid point.

ELKO COUNTY.

The United States Mining & Smelting Co. has purchased the Ivy Wilson group of claims at Contact and will commence operations at an early date.

ESMERALDA COUNTY.

(Special Correspondence).—An increase of over 300% in the amount of bullion tax paid during the second quarter of the current year over the corresponding period in 1908, bears witness to the increased activity in mining throughout Nevada and the most conspicuous showing is made by Esmeralda county, and Goldfield, particularly, which paid over \$50,000, of which the Consolidated company paid \$40,000. The quarterly report of the State bullion tax agent calls attention to the efforts of the Pittsburgh Silver Peak company in this county and the Bamberger-Delamar company, of Lincoln county, to evade the payment of proper bullion taxes by means of statements at variance with those issued to the stockholders and declares that the litigation started against the former will be pressed to a final conclusion. It is shown that the Florence Goldfield company finally paid the disputed tax, amounting to over \$10,000.

The management of the Consolidated Mines Co. has decided to stope the Combination and Red Top veins from the present workings to the surface involving the opening of gigantic 'glory holes' on both veins. Ore is being stoped on the Combination No. 2, on ground adjoining the old Reilly lease, one of the early bonanzas of the district, and from this point the workings are in good ore all the way to the Combination main shaft, a distance of 700 ft. From the surface a series of shafts will be sunk through the hanging wall into this vein and wall-matter broken for use in back-filling. Between the apex of the vein and the railroad track a large crusher will be installed and the crushed ore carried by a belt conveyor to the cars for transportation to the mills. The Red Top vein has been penetrated by the east cross-cut at the 330-ft. level, while a steady production is being made from the vein at the 260-ft. level. Within a short time the north drift from the Clemont shaft will reach this vein on the Lucky Boy claim at a depth of 600 ft., near the point where the vein turns to the west, and below the point where the largest stopes are opened at the 260-ft. level. The ore of this vein is rich and is mixed with lower grade material in milling. Shipments of high-grade ore from the Hampton stope and the rich orebody exposed at the 403-ft. level of the Mohawk, have been resumed and 4 carloads have been sent to the smelter which sampled from \$600 to \$1200 per ton.—An adit is now being driven into the hill at the southern end of the Jumbo claim to tap the veins which yielded exceedingly rich ore to lessees several years ago, the first objective point being the old workings of the Zinn lease. The management announces that during the coming autumn, probably in November, underground surveys will be completed upon which to base an appraisalment of the company's ore reserves. The mines of the Consolidated company now have over 35 miles of workings, with ore exposed in many points, and the available tonnage has been vastly augmented during the past six months. A winze has been sunk 50 ft. from the sill floors at the 600-ft. level of the Mohawk and a drift from the bottom of this winze is being driven in good ore. The pump and electric installation are completed at the 1000-ft. level of the Cler-

mont shaft whence a cross-cut has been started toward the Mohawk vein. Low-grade ore has been found at the 860-ft. level, but the vein is still some distance away, and at the 730-ft. level the orebody is proving of excellent proportions and is being rapidly developed.

Goldfield, August 31.

LYON COUNTY.

On the 500-ft. level of the Mason Valley mine a cross-cut opened a body of high-grade ore. The cross-cut was started to intersect the ore found on the 400-ft. where it averaged 3% copper. The grade on the 500 was higher, however, as the ore contains a large amount of bornite. A blind lead of native copper was also opened which the company will sink on. There is considerable talk of the Mason Valley and Bluestone mines consolidating this month.

NYE COUNTY.

(Special Correspondence).—The winze from the 1050-ft. level of the Belmont has reached a point below the 1100-ft. level, and has cut several stringers of good-grade ore. A 5-ft. vein has also been opened that is estimated to run about \$30 per ton. S. H. Brady is superintendent.—The Mizpah shaft, at the Tonopah, has reached the 1500-ft. level and a sump has cut 24 ft. below this point. A station will be cut and the territory between this point and the 600-ft. level thoroughly prospected.—A small vein of good ore has been struck in the hanging wall of the Triangle vein on the 390-ft. level of the Montana-Tonopah.—It is reported that the Bullfrog-Sioux company is arranging for the erection of a custom mill at Pioneer.—The Herring lease on Jim Butler has struck a shoot of ore running \$20 to \$100 per ton.

Tonopah, August 31.

WHITE PINE COUNTY.

Thomas H. Cole, of Duluth, has secured an option on 229,175 shares of the Butte-Ely treasury stock at \$1 per share.—The Ely Central has commenced work on its property east of Copper Flat and will sink the shaft to the 550-ft. level.—The drills of the Nevada Consolidated company are working near the Liberty line and the ground there is being proved excellent for steam shovel mining.—The road from the Success mine to the McGill smelter has been repaired and a contract let to haul the ore from the mine to the smelter, 23 miles.

OREGON.

JOSEPHINE COUNTY.

The United Copper-Gold Mining Co., of Salem, has completed the wagon road from Booth Ferry to its holdings on Pickett creek, 14 miles from Grants Pass, and is hauling in machinery for its plant. The company has a compressor, machine drills, and power plant, and is planning a large amount of development work. A contract has been let to a Portland firm to erect a 50-ton smelter and if it proves successful, a larger plant will be erected. O. A. Thomas is manager.

UTAH.

JUAB COUNTY.

The east cross-cut from the 225-ft. level of the East Tin-tic Development Co.'s property opened a 15-ft. vein of ore. The company will sink the shaft to the 500-ft. point.—A contract has been let to sink the shaft of the Swansea Consolidated company 200 ft. This will make the shaft 1065 ft. deep.

TOOELE COUNTY.

The fifth building of the International Smelting & Refining Co., at Pine canyon, has been started. The steel-work for the power plant is completed and the brick-work under way. The structural steel for the roaster building is on the ground and the foundations nearly complete.

WASHINGTON.

STEVENS COUNTY.

(Special Correspondence).—It will require three weeks to drain the Old Bonanza mine, near Bossburg, when 30 men will be employed.—The aerial tram at the First Thought

mine is being put in shape to handle an increased output. It is reported that 100 men will be employed in this mine by October 1.—Good looking vein material has been cut by the Blue Grass adit, on Toulon mountain.—The Border Mining & Milling Co. has purchased a water-right on Boulder creek to generate 3000 hp.—The Northport Smelting & Refining Co. has had a survey made, to define its property, from the Northport town-site, and it is reported will extend its yards and erect new buildings.—The Oriole Mining Co., in Metaline district, is inviting bids for the installation of an air-compressor and machine-drills. A concentrator will probably be installed for handling low-grade ore.—Machinery is to be installed at the Tungsten King mine. A bid has been received by the company from France for the entire output of the mine and concentrator, which is expected to amount to about \$15,000 per month.

Colville, August 24.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The Nickel Plate mine, at Hedley, has been taken over by the Exploration Syndicate, of New York, made up of M. K. Rodgers, of Seattle, and numerous stockholders of the United States Steel Corporation; the price was in the neighborhood of \$1,000,000. T. Walter Beam, a representative of the syndicate, is temporarily in charge of the property. It is not yet announced who will be the active manager for the company, though it is certain that Mr. Rodgers will be influential, as he is one of the heaviest individual stockholders. The property was, prior to this purchase, in control of the Daly estate. It is announced that some extensive development will be done.

Hedley, August 26.

On Whipsaw creek, a tributary of the Similkameen river, a 22-ft. vein of lead-silver ore has been discovered. Three claims have been staked by Knight and Day, and a number of open-cuts run through the vein. The average of a number of samples assayed 60% lead, 26 oz. silver, and \$1.60 gold per ton.—The British Columbia Copper Co. has secured an interest in the New Dominion Copper Co., and it is understood that the two companies will be consolidated the ore going through the British Columbia company's smelter. This company has also secured a bond on the Sapho group, near Midway. A large amount of development work has been done on the property, and a good tonnage of copper ore blocked out.—The Athabasca mine, near Nelson, has been purchased by a new company and will be re-opened.—J. S. Airheart has bonded the United mine near Ainsworth, and will concentrate the ore at the Highland plant.—A 7-ft. vein has been opened on the Black Hawk, Red Hawk, and Night Hawk claims on the Salmon river. The ore is similar to that coming from the Nickel Plate mine.—O. L. Knight & Co. have secured a contract for a large amount of diamond-drilling in the Le Roi mine. This work is expected to keep three machines running for the next six months.—Considerable surface work is being done at the Hattie Brown group, recently acquired by the Fife Mines, Ltd., and it is reported that the company is to prospect the ground with diamond-drills. Charles Dempster is manager.—The tramway at the Vancouver mine, near Silverton, is being repaired and the mill will be running at its full capacity in a short time.

ONTARIO.

The shaft of the Cobalt Townsite Mining Co. has been unwatered and operations resumed at that mine. Considerable lateral work has been done on the 110-ft. level, and some ore shipped.—The surface work on the Nipissing has opened two more veins on that property, making the total 130. Both are decomposed with large amounts of argentite, assaying from 4000 to 5000 oz. of silver per ton. Number 130 is 4 in. wide and has been stripped for a distance of 60 ft., while number 129 is 2 in. wide, and is only opened for a few feet.—The diamond-drill on the Alexander property has cut the slate at a depth of 250 ft., and the shaft will be sunk to that point. The shaft is now down 160 ft. and the drill-core indicates that a 2-in. vein is within 65 ft. of the point the company proposes to sink

to.—A cross-cut from the 190-ft. level of the Cobalt Lake mine opened a 2-in. vein when in 90 ft. A drift is being run on the vein and the ore sacked.—The Jacobs Exploration company opened a 20-in. vein on the 170-ft. level of the North Cobalt property.—Page and Pickens, the crack Arizona drill team, easily won the drilling contest at Cobalt, distancing the nearest competitors by 13 in.—The cross-cut from the 60-ft. level of the Nancy Helen opened a 6-in. vein with a 3-in. streak assaying 6000 oz. of silver. Two 1-in. veins were also cut.—A complete electric-driven compressor plant has been ordered for the Bailey mine and the company has started grading for its installation.

QUEBEC.

The Spalding iron mine has been bonded for \$500,000 with the understanding that the holders of the option expend \$50,000 in development work on the property.—The Eustis mine, near Sherbrooke, is shipping 1500 tons per month of ore that runs about 45% sulphur, to chemical firms in Boston. The residue is shipped to the Eustis smelter at Norfolk, Virginia.

MEXICO.

CAMPECHE.

A valuable deposit of whiting (chalk), estimated to contain over 3,000,000 tons, has been discovered close to the banks of the Chamton river, State of Campeche, and will be actively developed by the International Whiting & Fibre Co., of Mobile. W. H. Bell, of Vicksburg, Mississippi, is president of the company, and J. T. Burk is vice-president.

CHIAPAS.

The Pan-American railroad reaches to a point about 40 miles south of Tapachula, close to the Guatemalan frontier, and the gap from this point to the nearest Guatemalan railroad (the Champerico and Ocos lines) is only about 40 kilometres. Pending the completion of the line an effort is being made to establish a mail service.

CHIHUAHUA.

Over 3000 tons of 70-lb. steel rails have been ordered to replace the 45-lb. rails on the Sierra Madre & Pacific railroad, thus showing the determination on the part of the Pearson interests to bring these lines up to modern standards.

GUERRERO.

The discovery of high-grade amethysts on ground that also yields gold and silver is of interest. The gems are said to be of fine quality. The owner of the claims that contain these is Plácido García, and the claims are at Taxco.

HIDALGO.

A bad fire occurred on August 10 in the lower levels of the El Paraíso mine at Pachuca. Three native miners are known to have lost their lives, eight are still missing, and several were injured. The fire has been extinguished, but it is still impossible to get to the lower levels owing to the dangerous condition of the works where the timbers are burnt out.

JALISCO.

The Southern Pacific has commenced construction from Tequila, Jalisco, northward and will soon tap the mining district of Hostotipaquillo. The roadbed is completed 20 miles up to Quemada, and it is expected that the line will be in operation by October 1.

It is reported that the properties of the Quien Sabe Mining Co., near Guadalajara, are to be re-opened shortly. There is a modern reduction plant on the property and considerable ore blocked out in the mine. Patrick Blalack owns the controlling interest in the company.—The new plant of the Tajo Mining Co., operating in the San Sebastián district, is handling 30 tons of ore per day. Robert H. Lilly is manager.

MEXICO.

The Cia. Manufacturera del Hormo Partridge, S. A., is erecting an experimental plant in the City of Mexico. It is reported that the company has secured London backing to erect a larger plant at Manzanillo. Allen R. Partridge is the inventor of the furnace and the moving spirit in the company.

Special Correspondence.

DENVER, COLORADO.

Smelter Situation. — Chlorination at Georgetown. — Cyanidation at Central City. — Land Frauds and Taxes on Coal Lands. — Geological Survey.

The smelting situation at Denver is becoming interesting. In recent years there has been a marked decrease in the amount of ore treated here. The bulk of the Cripple Creek ore now goes to the mills rather than to the smelters and neither new camps nor new discoveries in old mines have come forward to take its place. The smelters say the shortage is natural. The miners complain of high smelting rates. To meet the situation there is much talk of new smelters and mills. The Carpenter smelter, at Golden, has been purchased by the newly organized North American Smelter Mines Co., and is being prepared for a run. A Vivian reverberatory furnace, designed by Geo. G. Vivian, recently of the Knight smelter, at Tintic, Utah, is to be built, electric power will be installed, and in all, some \$25,000 is to be spent in improvements. The smelter was built nearly 10 years ago by F. R. Carpenter for Berry Bros., of Detroit, and is designed especially to treat the pyritic and dry ores of Gilpin and Clear Creek counties. When it was running before, a \$3 smelting rate was established, and there was a great ransacking of old stopes through the two counties. The Saratoga mine, owned by Berry Bros., however, furnished much of the ore. It is doubtful how much ore would be brought out by a re-establishment of the old rate. The large producers are known to be under contract to the A. S. & R. Co., and the latter will undoubtedly fight to retain as much as possible of the free ore. Fortunately the Riedel Investment Co., which is backing the North American company, can rely on considerable production from mines which it controls, along the Rochford tunnel on Donaldson mountain. Work here is to be pushed rapidly, and \$50,000 is to be spent on development with Frank H. Nye, formerly State Mine Inspector, superintending, and J. H. Robeson as consulting engineer. It may be safely predicted that considerable ore will be found but whether enough to supply the smelter is less certain. There is the more doubt as to the outcome since the Modern smelter at Utah Junction is already in the market, and is stocking up preparatory to going into blast. This is a small but complete plant which must necessarily rely largely on Gilpin and Clear Creek counties for ore. The North American has bought the Kilton sampler at Idaho Springs, and presumably will buy or lease a plant at Central City. The Modern, on the other hand, proposes to sample at the smelter, and to give the miner some benefit from the decrease in cost. There are naturally all sorts of rumors as to impending cuts in rates, but nothing has yet been officially announced. To add to the interest in the situation, construction is already under way at Georgetown on a new mill in which the Malm dry chlorination process is to be applied, and plans are well matured at Central City for a 300-ton cyanide mill to do custom work. The attempt to cyanide Gilpin county ores will be watched with interest, as previous efforts in this direction have not succeeded. Marshall R. Draper and Percy Alsdorf refused to be scared, and the present enterprise is founded on the results of nearly a year's work in one portion of the mill of the Fifty Gold Mines Corporation. That they are not to be alone in the work is indicated by the announcement that Henry P. Lowe, who now has the Topeka, Frontenac, and Adduddell mines, is preparing to erect a 10-ton experimental cyanide plant at the Frontenac or Iron City mill.

The Rocky Mountain smelter at Florence, built seven years ago by some enthusiastic Iowa capitalists to treat Cripple Creek ores by the pyritic process, is to be sold, September 24, to satisfy a judgment in favor of the Iowa Fiduciary Co. for \$78,130. The plant originally cost \$250,000. It ran for a short time only. About two years ago the Colorado Smelting & Refining Co., with which was asso-

ciated the Troy Consolidated Mines Co., took over the property, and prepared to put it in operation. Evidently the managers thought better of it later, as nothing was done, and it still stands idle.

Coal-land frauds are again to the fore. The Government has just brought suits in equity to recover lands and damages for coal extracted, both in Rout county and near Walsenburg. A number of well known Colorado men are involved. It is charged that the land was illegally entered. The Black Hills Land & Cattle Co., and the Yampa Fuel & Iron Co., are the concerns involved. At the same time the assessor in Huerfano county is in trouble, and about to be removed by the Governor for assessing as grazing land the reserve lands held by the coal companies. He has, following what has heretofore been the custom, assessed as coal-land only that from which coal is actually being produced. As to the equitable method of assessing unmined mineral there is room for much difference of opinion, and the case will be watched with much interest by the big coal companies. If all their reserve lands be taxed on their coal value there will be a big difference in the revenue of the State—and in the profits from coal mining.

The geological survey of the Breckenridge district is nearly complete. E. S. Bastin, who has been assisting F. L. Ransome in the work, will leave September 6 to take up detailed work at Idaho Springs, following the work done there a few years ago by J. E. Spurr and George H. Garrey. Mr. Bastin will extend the surveys to the north to include Central City and adjacent districts.

LONDON.

Carn Brea & Tincroft. — Low Fuel Costs. — Conditions in Cornwall.

During the last year I have referred more than once to the increasing output of one of the old Cornish tin mines, the Carn Brea & Tincroft. The figures for the first half of the current year further confirm the impression previously given that increased efficiency is being carefully studied. With practically no additional plant the amount of ore treated during the six months was 36,825 tons, as compared with 34,790 tons, 31,828 tons, and 29,677 tons during the preceding half years. The tin concentrate sold was 567 tons as compared with 518 tons, 457 tons, and 396 tons. That the increased output has not been at the expense of the quality of the ore may be seen from the fact that the average produce during the half year was 34.55 lb. of concentrate per ton of ore, as compared with 33.40 lb., 32.2 lb., and 29.91 lb. The average price obtained for the concentrate was £69, as compared with £68, £73, and £87, and the amount realized was £39,428, as compared with £35,518, £33,845, and £34,649. From these figures it is clear that in spite of the low price of tin the mine has enjoyed a larger income from a higher production of ore and concentrate. In fact in 1906, when prices were so high the half yearly income was not as great as at present. In addition to the tin concentrate, small amounts of arsenic, copper, and tungsten ores were produced and sold, so that the total income was £42,846. The costs work out at £39,746, and the lord's dues £1550, leaving a net profit of £1550. The development and exploration work at Carn Brea & Tincroft are being carried out with vigor. At six different points rock-drills are being used in development, and at eight hand labor is employed. The general safety of the workings is being attended to more carefully than formerly, an improvement in policy rendered necessary by several recent accidents. Timbers are being renewed, and at several points concrete has been used in strengthening weak points in shafts. The engineers have had a good deal to say recently with regard to their economies in the fuel consumption at the steam plant. They are in keen rivalry with the other mines, such as South Crofty, where electric power is used. The figures for coal consumption for the half year are 1737 tons. It is calculated that the cost of hoisting the ore to the surface, including the hoisting of men and supplies, comes out at just over 3½d. per ton of ore. It will be noticed that in spite of the improvements in production, the margin of profit is small. The company oscillates pretty regularly between profits and

losses, and share-holders seldom get anything. This state of things is typical of most of the Cornish mines nowadays. The share-holders are chiefly people who have a stake in the county in other ways, either as landowners, merchants, or tradesmen. To them the further impoverishment of Cornwall, consequent on the closing of a mine is a more serious thing than the absence of dividends.

About a year ago it was mentioned in these columns that the directors of the company had for a long time been thinking of raising new capital and bringing the workings and machinery up to date. Whether or not this will be eventually effected remains to be seen, but in the meantime the efforts to more fully utilize the present resources have been suitably rewarded.

NOME, ALASKA.

Artificial Freezing of Flooded Mines.—Rosene Concession in Siberia.
—Big Nuggets from Kuskokwim.—Russian Restrictions in Siberia

A new era in the development of placer-mining, which has thus far proved successful, has aroused the lethargy of third-beach operators. A big syndicate, heavily capitalized, will continue the ammonia-freezing process in all the recent flooded claims, and the work is now thoroughly under way. Late in June a terrific geyser broke from the shaft of the Bessie mine, sending a column of water 70 ft. into the air. This flood subsided only when nearly all the contiguous claims were drowned out, the operators and miners barely escaping with their lives.

Freezing by means of forced ventilation in winter has been in vogue in Alaska for years, hence it is but a step from this method to the new scheme of artificial freezing recently adopted by the operators of the Cyrus Noble claim for accelerating summer work. In eight days, at an expense of \$1000, the lower drifts of this mine were effectually frozen and a continuous flow of 6 to 10 miner's inches of water stopped, so that mining could be resumed. The plant was installed by an engineer of the Nome Cold Storage Meat Co., and is proving so successful that similar efforts will be made by other operators of the adjacent flooded properties, comprising the heaviest gold producers of the Nome district, namely, the Bessie, Saturday No. 2, Nettie, Mable, Cyrus Noble, and the Portland bench, and other Little creek mines of the Pioneer company. The lessees and owners of nearly all the claims in the flooded district have combined, and the construction of a two-mile drainage tunnel to the sea will begin at once, to prevent a recurrence of disaster should the steam-points at any time again penetrate the subterranean flow which for years has blocked development and production.

Several big gold nuggets, the largest of which weighs 29 oz., were brought down from the Innoko regions by A. Pelky, a recent arrival. Each shows a sprinkling of ochre-colored quartz, resembling the cinnabar ore which is so profuse in the upper tributaries of the Kuskokwim. There were seven of these in all, weighing respectively 29, 15¼, 12, 10½, 6, 5¼, and 3½ oz. A big poke of coarse gold was also exhibited with these in the windows of a Nome jeweler. For days crowds thronged the place to get a glimpse of the treasure. The assay value of the gold comprising the nuggets was computed at \$19.75 per oz. It is needless to say that the Kuskokwim stampede has started afresh.

With the opening of navigation came reports confirming the withdrawal of Jafet Lindeberg and the other American stockholders in the mining concession known as the North East Siberian Mining & Trading Co. No supplies or laborers were sent to Anadyr from Nome this year by the president of the Pioneer company, and Siberia has been dubbed a 'dead one' by all Alaskan operators. Active work on the diggings prospected and worked last year, from which the product of over \$10,000 was fished by the Russian governor by the aid of a gunboat, however, has been resumed by the Russian stockholders, who have bought out the American interests. Added to this, Governor Kalikikoff has promulgated an imperial edict from the Czar to the effect that all trading of craft from Nome or elsewhere must stop inside the concession limits, namely, Cape Alexander to Cape Serdge, in the Arctic ocean, under penalty of confiscation.

The whole fleet of ivory, fur, and whalebone traders is accordingly scattered in consternation, trying to avoid the gunboat patrol already installed on the Siberian coast. Nome is, in consequence of recent stampedes, utilizing many of the 'mosquito fleet' in furnishing supplies and transportation to the Kuskokwim and upper river mining regions tributary to the Yukon river. Nome in a business sense is very dull, while mining is also backward, owing to the dry season and dearth of water. Upward of forty business houses in the city will close this fall, but an era of increased activity in dredging and big capitalized projects is promised in the near future that will materially increase placer products of Seward Peninsula.

KALGOORLIE, WESTERN AUSTRALIA.

Golden Horseshoe.—New Plant.—Monthly Output.—Australasian Institute of Mining Engineers.

Excepting a good strike in the Golden Horseshoe at 1700 ft. and a few small finds in other mines, there is little to note for the month. It may be mentioned that work in the deep winze from level 14 in the Great Fingall is showing better ore than formerly, and it is to be hoped that such will continue. Many years ago this mine was abandoned, as nothing was found payable below the third level; but on being re-opened a great quantity of good ore was worked, keeping 100 stamps busy for several years and many dividends were paid. A poor zone was entered about the fourteenth level, and now only about 50 stamps are operating. A vacuum slime-plant is at work on this mine. At the Perseverance main shaft it is proposed to install skips from the 1900-ft. level. An ore-bin will be cut out at this level, and it is also proposed to erect a hoist here, and haul from lower levels to this point. This is the only instance of stage-winding on this field, and results will be watched carefully. A trial is to be made with the vacuum process on the roasted ore at the Perseverance. This is interesting, as this mill has a large press plant of 12 five-ton capacity presses, and a former management had a trial of the Moore process, but results were never published. There seems to be a feeling among many here that the vacuum process will not be a success on fresh slime for either the wet or dry crushing mills; anyhow, there is no rush to install vacuum plants in the big mills.

The second A. E. G. turbo-generator of 500 kw. is now running on the Horseshoe. These generate power for motors all over the surface, and are giving great satisfaction. As the tonnage is now approaching 25,000 tons per month, 15 new Wilfley tables are being installed to deal with the tubemill product; and pumps are being erected to pump the concentrate instead of trucking from the tables. For some time past the Government Water Supply Department has been troubled by rapid decay of the cast-iron water-mains in Kalgoorlie and Boulder City, and attribute this to leakage of current from the electric tramway system. In order to test whether electrolysis is going on or not, 22 small meters have been set up in the 20½ miles of tramways, at regular intervals, and connected with the rails. The test has just started, and will be watched closely.

During June the principal mines returned as follows:

| Name. | Tonnage. | Value. | Profit. |
|------------------------------|----------|-----------|----------|
| Associated | 11,284 | \$100,000 | \$25,000 |
| Associated Northern Blocks.. | 3,750 | 32,000 | 12,000 |
| Golden Horseshoe | 24,013 | 255,000 | 100,000 |
| Golden Ridge | 2,188 | 28,000 | 14,000 |
| Great Boulder Proprietary... | 18,188 | 250,000 | 132,000 |
| Great Boulder Perseverance. | 18,262 | 135,000 | 17,000 |
| Great Fingall | 10,172 | 70,000 | 4,000 |
| Hainault | 5,180 | 34,000 | 4,800 |
| Ivanhoe | 18,962 | 200,000 | 100,000 |
| Kalgurli | 10,580 | 140,000 | 75,000 |
| Kalgurli South | 9,039 | 62,000 | 15,000 |
| Lake View Consols..... | 11,053 | 76,000 | 13,000 |
| Lancefield | 4,534 | 38,000 | ..... |
| Oroya-Brownhill | 11,420 | 100,000 | 33,000 |
| Oroya-Black Range | 4,273 | 53,000 | 19,000 |
| Sons of Gwalia | 13,040 | 102,000 | 34,000 |
| Sons of Gwalia South..... | 1,900 | 22,000 | 4,500 |

Since the recent meeting of the Australasian Institute of Mining Engineers in this centre, the local members are about to form a branch, just as has been done in America with the Mining & Metallurgical Society. It is proposed to hold meetings once a month, and without doubt some interesting and valuable discussions will be forthcoming. The annual meetings are all very well, but in a country of such distances as in Australia, a large crowd seldom gets together; and with frequent meetings the Institute will become a live affair.

CHIHUAHUA, MEXICO.

Republica Mine.—Development in Cusihiuiriachic. — Dios te Guie.

The República mine, near Ocampo, in the Rayón district of Chihuahua, which, through inability to get fuel during the heavy rainy season, had to cease operations and was partly flooded, has again been able to contract for the wood needed for fuel, and the work of unwatering will soon be started. In the meantime the new manager, E. H. Webster, is re-treating some of the tailing in the mill, a part of the dump, and some surface ores, that the former management did not consider of high enough grade, so that the shipments of concentrate and bullion will undoubtedly be resumed early in October.

At Cusihiuiriachic the Promontorio, of the Cusi Mining Co., controlled by Potter Palmer, Jr., of Chicago, and under the management of M. F. Crosette, is opening up splendidly. This property was bought the first of this year, from Delgado & Barcenas, for \$115,000, and already shows more than double that value with very little development work, and it is looked upon as one of the nicest small purchases that has been made in Chihuahua for several years. The ore is highly silicious and taley, assaying several hundred ounces silver and about 2% copper. The copper, however, is finely disseminated through the ore as chalcopryite, but it is believed that the ore will lend itself readily to concentration after fine grinding, and thus cleaned of the copper the tailing may be cyanided; with this idea the company will make its experiments for the erection of a mill. Another mine that has developed into a wonderfully rich one, at a comparatively small purchase price (\$25,000) is the San Francisco of the Qualey Bros, in Yoquivo. It has been mentioned several times in these letters. New machinery has recently been erected and shipments will soon be resumed. Tests are being made in Denver on the ore with a view to planning for a mill. The Qualey Bros. have also just taken a lease and bond on the Dios te Guie mine in the Guerrero district, and it is understood that the developments would certainly indicate that God is guiding them, as the name prays, and that we will soon hear of another rich mine in western Chihuahua.

MEXICO.

New University.—Oil and Gas in Mexico.—Llanitos Mines. Durango.—

Railroad Extensions.—Buena Fe, Jalisco.—Coal Mining Activity.

—Mining Law.—El Tigre.

The sub-secretary of Public Instruction, Ezequiel A. Chávez, has just returned from California, where he was sent by the Mexican Government to study the higher educational methods of that State. He included in his tour the universities of Stanford and Berkeley. At the latter he was a guest for six weeks. Señor Chávez is preparing a report for the Ministry of Public Instruction. His visit was in relation to the National University, which is to be inaugurated on the centennial of the independence of Mexico on September 16, 1910. This will be the first modern institution of higher education in Mexico.

In view of the present political disturbances and of the pessimistic attitude of many foreigners toward the immediate future of Mexico, it is interesting to note that powerful capitalists still have confidence, as is evidenced by investments recently made. Contracts have been let for over \$1,000,000, and active construction work has been begun on the gas plant for Mexico City. Gas is to be manufactured from crude oil supplied from the Ebano oilfields. A large part

of the machinery has arrived at Tampico, and over 2000 tons of cast-iron pipe has been delivered at Mexico City. The plant to be erected will have a capacity of 1,000,000 cu. ft., and is designed on the same general lines as those at Los Angeles and San Francisco, California. The company owning the concession and erecting the plant is known as the Mexican National Gas Co. E. L. Doheny is president, and C. A. Campbell vice-president, both of Los Angeles; W. L. Mardinis is assistant secretary, and J. W. Warren general superintendent.

The Ebano oilfields are owned by the Doheny interests under the title of the Mexican Petroleum Co., and it is stated that the wells are producing heavily, and yet there is an unexplained shortage of fuel-oil on the National Railroads, which draw their supply from this source. The statement is credited to J. J. Waters, superintendent of motive power on the railroad, that unless there is an improvement in the oil situation, more coal-burning locomotives will be placed in commission. A pipe-line is to be constructed from what are known as the 'lower' fields of the Mexican Petroleum Co., near Tuxpán, Vera Cruz, to Tampico, a distance of over 100 miles, and a pipe line will be built to Mexico City.

W. E. Burk and H. W. Palmer, of Louisville, Kentucky, are now in Mexico City arranging for the immediate construction of a large portland cement plant, to have a capacity of 200,000 bbl. per year, and it is expected that the plant will be in full operation inside of one year. A great deal of machinery has already been purchased. The plant will be situated a short distance from Mexico City on the line of the Mexican Central. The papers have been signed which make the final consolidation of the hydro-electric and power interests in the State of Jalisco, to which we have already referred. The new company will be the Cia. Hidro-eléctrica é Irrigado de Chapala, S. A., which will absorb the Cia. Nueva de Tranvías Luz y Fuerza Eléctrica de Guadalajara. The capital of the new company, as finally arranged, will be \$12,000,000 in shares, with an issue of \$6,000,000 in bonds. E. Pinson will be manager.

The Sierra Madre Land & Lumber Co. has been absorbed by the F. S. Pearson interests for \$2,000,000, and this now adds something like 3,000,000 acres of lumber lands to the consolidation of interests held by Mr. Pearson in northern Mexico. Luis Riva is the legal representative of the Pearson interests in Mexico City, who carried through the transfer. Hiram C. Smith is the vice-president and general manager of the lumber department of the Mexican Northwestern Railroad Co. Interesting mining developments are going on in northwestern Durango. The Llanitos Consolidated Mines Co., owning mines in the mining camp of San José de Los Llanitos, is putting in a hydro-electric power-plant to supply power to run a number of diamond-drills, which are being used to push exploration and development, and block out as large a body of ore as possible with the least delay. For the last 20 years rich ore has been shipped from this camp on mule-back to Culiacán, where it was purchased by the ore-buyers. Large shipments have been made which ran as high as \$1 per pound of ore. The yield of some of the rich streaks has run as high as 32 oz. gold, and 1126 oz. silver per ton. Besides these, there are large bodies of low-grade ore. It is the intention of the company to erect a modern mill and cyanide plant. There are other important camps in this district. Close to the Llanitos is the San Andrés de la Sierra, which has produced more than \$13,000,000 in silver, and the La Portilla, which made a shipment of 20 donkey-loads of ore that produced \$40,000. Besides these are the well known mines of Velardeña, Penoles, Pedriceña, Ventanas, and Guanacevi. The extension of the Mexican International railroad beyond Tepehuanes will open up and assist to develop this valuable mineral region, and numerous properties now lying idle will re-open.

The announcement that a big mill, with a capacity of 1000 tons per day will be built by the Palmilla Mining Co. near Parral has had the effect of greatly stimulating mining in the district, and a hopeful spirit exists.

A few days ago the first through sleeper made the run between Mexico City and Salina Cruz. This new service will be a great boon to mining men who contemplate the trip to the Far South. He can now go through from the

United States to the Isthmus of Tehuantepec, and continue his trip by steamer on either ocean, and soon he will be able to travel still farther, as the missing link of railroad on the Guatemalan frontier is being fast pushed to completion. By January 1, 1910, it will be possible to go by rail from the United States through Mexico to Guatemala City.

From Jalisco comes news that the Buena Fé Mining Co., operating near Ojuelos, is erecting a large plant, including a gas-producer using charcoal, a Westinghouse three-cylinder gas-engine, which will be used to drive an electric generator and an air-compressor. Electrically driven station and sinking pumps will be used in the mines. The G. & O. Braniff Co. supplied the plant. As the result of the new protective tariff on coal, the coal-mining camps of Coahuila are becoming prosperous. The Mexican Coal & Coke Co., which is operating mines at Esperanzas, has recently placed orders for a considerable amount of extra machinery, including an 1100-hp. Schoendube and Nengebaur steam turbine and condenser, which will be used to drive an A. C. generator; also a number of transformers, motors, and accessory electrical apparatus. The same company has also ordered 16 Sulzer pumps, the largest being a 350-hp. multi-stage centrifugal.

The Chapanal mine, near the old Quecillas mine in the district of Zacualpán has been sold by the Rodriguez Bros. to a company in the City of Mexico, and the construction of a stamp-mill and concentration plant has already been commenced. Electric power for this plant will be obtained from the Seguranza Mining Company.

Various opinions are expressed regarding the new mining law, which will go before the Mexican Senate during the month of September. Some are of the opinion that extensive changes will be made, but authoritative opinions expressed in high governmental circles are to the effect that the bill will probably go through the Senate practically without change, or only with minor modifications.

The deal for El Tigre mine in Sonora has fallen through. The mine was to have been sold, two-thirds for \$4,000,000, to New York and South African capitalists. Payment of \$250,000, to have been made August 21, was not forthcoming, and the sale is off. This mine was bought a few years ago by Kansas City people for \$600,000. They then had a lawsuit which cost \$250,000, but none the less have done well. The mine has been paying 7% per month on the capitalization of \$600,000. The Mexican company is El Tigre. The American company owning the stock is the Lucky Tigre, of Arizona.

GUADALAJARA, MEXICO.

Oro Grande Mines Co. — New Reduction Plant. — Amparo Mines. — Aguascalientes Metal Co. — Smelter in Guerrero.

The Oro Grande Mines Co. has just been launched in the United States to take over, re-open, and further develop the famous old La Luz, Refugio, Bolañitos, Melladito, and Tolentino mines in La Luz camp of Guanajuato, and to erect a reduction plant with a daily capacity of at least 1000 tons. It marks the second attempt to carry out these projects, as the Refugio Mines Syndicate was organized several months ago to work along the same lines. However, the flotation did not prove successful, and the stock was withdrawn from the market. The new company has a capital of \$9,250,000, of which \$2,750,000 is 6% cumulative preferred, and the remainder common stock. William R. Roney is president; George W. Bryant, vice-president and resident director in Mexico; John H. House, secretary, and Frank G. Peck, treasurer. The old mines number 38, and they are credited with a past production of fully \$100,000,000. The dump contains approximately 500,000 tons of ore, and there is much low-grade ore in the old workings. According to the plans, the reduction plant to be erected shortly at the Tajo de Dolores mine, in the Guanajuato district, will be one of the most complete in Mexico. It will consist of rock-breakers, forty 1350-lb. stamps, concentrators, 2 tube-mills, 8 Pachuca leaching tanks, and 2 filter-presses. The sand leaching plant will be dispensed with, all sands being re-ground, and everything reduced to

slime. The ore now blocked in the Tajo de Dolores amounts to 360,000 tons. The property is held by the Proprietary Mines Co., of New York. Difficult engineering work in connection with plans for unwatering the San Cayetano mines in the Guanajuato district has been completed, and the old workings will be now drained. The Lewisohns of New York are principally interested in the properties, and the mines will be thoroughly examined following the unwatering. Extensive development is likely.

The Amparo Mining Co., of Philadelphia, operating in the Etzatlan district of Jalisco, has just paid its third quarterly dividend of 2½%. In July 5010 tons of ore, averaging \$26.50 per ton, were treated in the Amparo reduction plant, and high extraction was secured. Patrick Blalack, president of the Quien Sabe Mining Co., which has been operating the Quien Sabe mines at Ajilic, Jalisco, on the northern shore of Lake Chapala, recently cleaned up over \$2,000,000 in land in and around Brownsville, Texas, and he will invest much of the money in mines in this portion of Mexico. The Quien Sabe properties do not constitute as big a proposition as Mr. Blalack desires, and they have been shut down pending a sale. S. C. Prunty, form-



State of Jalisco, Mexico.

erly with the San Luis Potosí smelter, is representing Mr. Blalack in this field, and other properties will be taken up and developed. The new reduction plant of the Tajo Mining Co., at the Tajo mines in the San Sebastián district, is working satisfactorily, the extraction being high. Thirty tons of ore, averaging \$30 per ton, are handled daily. The gold in the ore is sufficient to cover the mining and milling expenses, leaving the silver as profit. The Tajo mines are *antiguas* which produce about \$12,000,000.

A new body of ore has been opened in the properties of the Guggenheim interests in the Tepezalá camp of Aguascalientes, and there is now promise that these mines, which were believed to be giving out, will continue to produce heavily for years. In the Santa Francisca silver mine, in the Asientos camp of Aguascalientes, copper is appearing in depth, and the main shaft is now being put down to a depth of 260 metres (853 ft.). The Aguascalientes Metal Co., operating in the Asientos camp of Aguascalientes, has opened a shoot of rich copper-silver ore in its Orito property, and is sinking to a depth of 540 ft. The company is shipping more than 1000 tons of ore monthly to the Aguascalientes smelter. The Lead Queen Mining Co., of Aguascalientes has purchased the Tajos de Purísima mine in the Asientos camp from Francisco Morán. This is a promising lead-silver property. The Maine & Nebraska Mining Co. has completed a 100-ton smelter at its mines near Balsas, State of Guerrero, and the plant will be soon in operation. A railroad has been built from Balsas to the properties, a dis-

tance of five miles. The ore is an iron sulphide carrying gold, silver, and copper. F. M. Currie, of Broken Bow, Neb., is at the head of the enterprise.

BUTTE, MONTANA.

Copper Output.—Zinc Concentrator.— Sierra Mining Co. — Keating to Issue New Stock —British Butte.

Due to the fact that the Mountain View mine of the Boston & Montana Co., one of the Amalgamated subsidiaries, was closed nearly all month, the copper production of the Butte district in August shows a considerable decrease. The Mountain View yields about 650 tons of ore per day when operated to full capacity. The total production of the district for the month is estimated at 26,070,130 lb., the different companies contributing about as follows:

| Companies. | Ore, tons. | Copper, lb. daily. | Copper, lb. month. |
|-----------------------|------------|--------------------|--------------------|
| Boston & Montana.... | 3,200 | 243,200 | 7,052,800 |
| Anaconda | 3,605 | 223,510 | 6,481,790 |
| Butte & Boston..... | 650 | 40,950 | 1,187,550 |
| Washoe | 555 | 34,410 | 997,890 |
| Parrot | 390 | 22,620 | 655,980 |
| Trenton | 400 | 24,400 | 707,600 |
| North Butte | 1,390 | 116,760 | 3,386,040 |
| Butte Coalition | 1,500 | 108,000 | 3,132,000 |
| Original | 700 | 51,100 | 1,481,900 |
| Pittsburg & Montana. | 390 | 26,520 | 769,080 |
| Miscellaneous | 100 | 7,500 | 217,500 |
| | 12,880 | 898,970 | 26,070,130 |

The Butte & Superior Copper Co., which owns the Blackrock group of claims, will for the present pin its faith on the zinc ore deposits in the Blackrock, and has decided to erect a 300-ton zinc concentrator at the mine. The Blackrock contains an immense tonnage of zinc ore. W. A. Clark has built a large zinc plant at the Butte Reduction works for the purpose of treating ore from some of his mines. The Butte & Superior has been trying to find copper ore in paying quality and quantity in the Blackrock, but not with good success. The intention now is to concentrate the zinc ore regardless of the copper content. A 300-ton mill is a small concern considering the great quantity of zinc ore in the Blackrock mine. The new zinc mill is to be completed within five months, a contract for its erection having already been let. Engineers and others representing W. A. Clark have made some excellent reports on the zinc deposits in the Butte district, and have predicted that zinc will become of greater profit to Butte miners than copper. The district contains some of the largest zinc deposits in the world. The Alice group of mines, now owned by the Butte Coalition, has millions of tons of the ore in sight. The same is true of the Lexington mines owned by La France Copper Co., a United Copper Co. concern, and the old Emma mine, owned now by the Butte Copper & Zinc Co., a New York corporation owned by the Seligmans and associates, also has several million tons of high-grade zinc ore in sight. A great deal of zinc ore exists in the old Blue Eyed Nellie mining district west of Anaconda, the ore averaging about 36% zinc.

It would appear that the flotation of the Sierra Mining company, organized by Thomas F. Cole, of Duluth, was not the great success that was at first advertised. The announcement was that the stock had been greatly over-subscribed, but the later information was that everybody would get all they had asked for. The allotment was postponed from time to time. It is understood that the enterprise is one fathered alone by Mr. Cole, and is not one of the so-called Cole-Ryan propositions. Three hundred thousand shares of the stock have been offered for subscription at \$6 per share, \$4 more to be collected later. The Sierra is said to own several thousand acres of land in Mexico, including a lot of valuable timber and some old mines that were worked by the Spaniards years ago.

Stockholders of the Keating Gold Mining Co. received a surprise package from the directors in the form of an announcement that a special meeting would be held October

2 for the purpose of increasing the capital stock to \$2,000,000, the object being to provide more stock to raise money if possible. The stockholders had always been given to understand that the mine was paying well, and that dividends were in sight. The statement of the directors, however, indicates differently. It also develops that there is no stock left in the treasury. Considerable of the stock has been distributed in New York and elsewhere in the East.

Stockholders of the Butte & Ely Copper Co. have received notice that they are expected to contribute 10% of their private holdings to the option given Thomas F. Cole, of the Giroux Consolidated company, in order to make up a majority of the stock, and a condition imposed by Mr. Cole is that he shall have control. The directors gave him an option on the stock remaining in the treasury, amounting to 229,175 shares, at \$1 per share, payable on or before September 14. The stockholders are asked to contribute sufficient more at the same price to make up at least 250,005 shares. The stock has for some time been selling at about \$2 per share. While the option stands in the name of Mr. Cole personally, there is no doubt that he holds it for the Giroux company and the Cole-Ryan syndicate.

Although the British Butte Mining Co. is now making weekly clean-ups and shipping gold to the United States Assay Office from its dredge west of Butte, small stockholders in Montana who have grown tired of holding British Butte stock, have discovered that there is no market for the shares anywhere, although there was at one time considerable trading in them in London. The last quotations, however, were 8c. per share, and for some time not even one cent has been offered. The C. W. Syndicate of London practically owns the company, and its manager in Butte is the controlling authority. No directors' meetings have been held and no reports are made. The company is capitalized for 5,000,000 shares at \$1 par, and in addition to that the C. W. Syndicate has advanced several hundred thousand dollars, which is understood to be unsecured, and is hanging over the company as a claim that may be made preferred at any time.

GOLDFIELD, NEVADA.

Consolidated Mines Co. — Year-End Dividend. — Combination Estimating Ore Reserves.—Florence Mill Increase. — Discovery on Columbia Mountain.

It is announced by the management of the Consolidated Mines Co. that the directors, at their quarterly meeting in November, will consider the project of enlarging the capacity of the 100-stamp mill on Columbia mountain, and it is probable that at that meeting an extra dividend will be declared. After the payment of the July dividend there remained over \$1,000,000 in cash in the company's treasury, and profits have accrued at a rate which will render possible the distribution of an additional 30c. dividend before the end of the current year. This reserve fund will be materially augmented by receipts from the shipment of high-grade ore. A large amount of ore of this character is ready to ship, and it has accumulated to such a degree that at several points its presence impedes progress in development. For this reason shipments will be resumed at once from the Hampton stope and other points, particularly from the 403-ft. level of the Mohawk.

This company's mines are producing at the rate of approximately 22,000 tons monthly, of which 10,000 tons is from the Mohawk, 6000 from the Red Top, and 6000 from the Combination. The only production as yet from the Clermont is a comparatively small amount which is extracted in the course of development at the 730-ft. level, where the orebody is maintaining its early promise, the grade remaining well above the top milling limit. At the 860-ft. level low-grade assays are being secured in the cross-cut which is being driven for the same ore-shoot as above, but the ore is still some distance ahead. A powerful station-pump has been installed at the 1000-ft. level, the electric installation for its operation is completed, and extensive development will at once proceed from this station with the Mohawk vein, believed to be 400 ft. distant from the shaft at this depth, the first objective point. At the 600-ft. level

another 150 ft. should bring the north drift into the Lucky Boy orebody at a point where it turns sharply to the west from its north and south course from the Red Top. This vein is now opened on the Red Top at the 330-ft. level and driving is in progress both north and south from a point east of the Red Top shaft, with an apparent improvement in the character of the vein at this depth over that exposed on the upper levels.

Ore is being stoped at the southern extremity of the Combination workings in territory adjoining the famous Reilly lease on the Florence, the stopes being at the fourth level; and the ore has been cut at the sixth level as well. From this point to the main Combination shaft the workings at two levels are entirely in ore for a distance of 700 ft., and J. H. Mackenzie announces that the ore will be stoped to the surface, an operation that will result in a gigantic 'glory hole' for the entire distance and from 50 to 60 ft. in depth from the surface. The same methods will be pursued on the Red Top. During the coming autumn, probably in November, a complete survey of the mines will be conducted upon which to base a careful estimate of the value of this company's ore reserves. They have been added to greatly during the past six months, and will show some interesting figures, despite the fact that the value of ore taken out during the year will be in excess of \$5,000,000. Included in the company's recent work in a tunnel which is being driven from the line of the Cornishman claim of the Florence to tap the veins of the early leases on the Jumbo, the first point to be reached being the early workings of the Zinn lease, from which a large quantity of exceedingly rich ore was mined over four years ago. This territory has not since been touched. The giant stopes between the 450 and 600-ft. levels on the dividing line between the Mohawk and the Jumbo, are yielding a large tonnage of good ore, and a winze has been sunk from this point 50 ft. below the 600-ft. level, and a drift started from the bottom of the winze, which has been timbered, owing to the strong flow of water.

Within a few days the Florence mill will be operating at an increased capacity, treating 160 tons of ore per day. The new tube-mill, Card concentrators, and plates, are in place, and all is in readiness to handle a largely increased tonnage. The aerial tramway is now conveying ore from the Little Florence workings to the mill-bins, and development is in progress throughout the mine, with hundreds of feet of stopes opened, and a vast tonnage of excellent ore exposed at all levels down to the 500-ft., the deepest point in the mine. It is probable that a winze will shortly be sunk to prospect the Engineers' vein below the 500-ft. level, as the high-grade ore is exposed at this level. Mr. Lockhart has always believed this to be the richest vein on the Florence. The present ore-production of the Diamondfield portion of the Goldfield district is approximately 25 tons of ore per day, averaging fully \$75 per ton. With the opening of the ore-shoot in the old Detch stopes of the Millard-Jones lease on the Daisy, and with resumption of the Diadem lease on the Great Bend, this output will be materially increased. The Daisy company, while devoting but one-tenth of its work to production, is shipping 10 tons of \$75 ore per day, and has opened good ore in the old workings near the original incline shaft at the eastern end of the group. Development is constantly adding to the ore reserves. The Golden Daisy lease is shipping five tons of \$125 ore from the vein opened at two points on and above the 360-ft. level, and is blocking out reserves of rich ore in a shoot of excellent proportion. The Goldfield Belmont is shipping 70 tons per week from the lease-workings in the upper levels, and the company is developing a blind lead cut recently at the 200-ft. level. Unwatering of the shaft is being done in preparation for extensive development on the deeper levels.

At a depth of 110 ft. in a shaft sunk near the peak of Columbia mountain pay-ore has been exposed with seams revealing free gold, and assaying up to \$3000 per ton. The vein shows 3 ft. of good ore, with but one wall exposed, and the lessee, B. E. Thomas, has secured the privilege of using the company's tunnel which was driven 1300 ft. into the mountain from its base, and which will be continued to the vein by the lessee. The discovery has created keen interest, and a renewed demand for leases on inside territory. Some

rich samples of ore have been brought in from the Blue Bull upon which lessees opened the ore in a winze from a tunnel and have now cut the ore-shoot in a cross-cut from the shaft at the 150-ft. level. The adjoining Imperial has resumed, and a double-compartment shaft is being sunk, with low-grade ore appearing. The Nancy Donaldson shaft, in the eastern part of the district, has been timbered to the 100-ft. level and sinking has been resumed. Rich ore has been found on this ground at the surface, and at 18 ft. in depth in the shaft. An Eastern company, the West Trent Gold Mining Co., has started sinking a new shaft at a point two miles west of Goldfield, and will sink to the 400-ft. level before starting lateral development. Lessees operating on the Poleverde claim, the joint property of the Consolidated and Jumbo Extension, are sinking two shafts which will extend to the 1000-ft. level, as provided in their leases. They will be fitted with substantial timbering of Oregon pine, 10 by 10 in. for the last 500 ft. These shafts will cut the Clermont and other veins. One of the shafts is that of the former Goldfield Annex lease, already down 350 feet.

LOS ANGELES.

Developments in Coyote Hills.—Central Oil Co.—Gusher at Whittier.—Lompoc

Among the recent important developments in the fields south of the Tehachapi are the striking of oil in the Union's well in the Coyote hills and the Central's new well in the Whittier field. The Union's well is situated on the Bastanchury lease, six miles south of the Olinda-LaBrea Canyon fields and about a mile east of the Murphy Oil Co.'s productive wells in the Coyote hills. The oil was struck at about 4400 ft., and though nothing spectacular resulted when the sand was penetrated, the well is believed to be capable of good production. This is the second hole the Union has drilled on this lease, the first being spoiled in drilling, and nearly three years has been consumed in getting results. It is always a serious matter to put a hole down over 3000 ft., and the Union is to be commended for its perseverance in testing deep territory, not only in the Puente hills district, but in other parts of the State.

The Central Oil Co. has been rewarded in prospecting toward the eastern end of the Whittier field by bringing in a gusher of 32° Baumé oil last week. The productive stratum was encountered at about 2500 ft., oil spouting high over the derrick intermittently for several hours when the drill penetrated the sand. About 2000 bbl. was produced before the well ~~stayed~~ ^{stayed} up, but only about 500 of this was saved. It seems ~~too~~ ^{bad} that the usual accompaniment of striking a gusher is the wasting of a big percentage of the first flow. Another well in which the recent striking of productive strata is important is No. 2 of the Lompoc Oil Development Co. in the Lompoc field. Like the Union's Bastanchury, this is also the second well of the Lompoc company, its first on the same property being a failure on account of flooding water. No. 1 was nearly 3900 ft. deep; No. 2 struck the sand at about 3600 ft. This new well is the farthest east of any which has struck the productive zone on the Purisima hills anticline, and extends the proved territory for a considerable distance east of the heretofore developed ground. The reported strike of oil in the Devil's Den Consolidated well in the Devil's Den district should be received with some incredulity, as many of the accompaniments of the 'strike', such as the posting of 'no admittance' signs, and the ordering of inquisitive strangers off the property, lead to the conclusion that there is something about the well that needs concealing. The hole may contain some gas and oil, but it takes more than these indications and secretiveness to prove the productivity of a new territory.

The reported purchase of the Brockton lease on Sec. 23, T. 32 S. R. 23 E., Midway district, by the Palmer Oil Co., is interesting as corroborating the rumored policy of expansion of this thrifty company. With one of the greatest wells in the State (the Palmer No. 1 of the Cat Canyon field, Santa Maria district), to its credit, this concern ought to be in a position to build up a good size group of properties.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Speed in lead-smelting with the blast-furnace varies materially with the percentage of sulphur in the charge, the other constituents maintaining approximately fixed proportions. A difference of 1% in the matte-fall will often increase the capacity of the furnace from 8 to 10 tons per diem. The sulphur elimination in blast-furnace lead-smelting may be as great as 30 per cent.

Spitting of ores in scorification may be due to many causes, most commonly to dampness in the scorifier. Other causes are imperfect mixing of the charge, too low an initial temperature in the muffle, too deep a scorifier, and too early an admission of air into the muffle. To prevent spitting of lead, when the size of a lead-button is being reduced by scorification, it is important to heat the scorifier before introducing the lead.

Iron sesquioxide, Fe_2O_3 , forms silicates which are extremely infusible, hence this oxide is undesirable as a base for slags, and in roasting copper ores for smelting the effort is to produce as large a proportion of the ferrous oxide, FeO , as possible. As the FeO cannot exist in the free state some of it is further oxidized in roasting to Fe_2O_3 , and part unites with ferric oxide to form Fe_3O_4 . In the blast-furnace the higher oxides are reduced to FeO by the CO formed from the combustion of the fuel.

Olivine is a constituent of most basic igneous rocks, such as peridotite, norite, basalt, diabase, and gabbro. It does not normally exist in silicious rocks, since the fusion of olivine with silica produces enstatite. As the silicious content of an igneous rock increases, the olivine is replaced by pyroxene. But there are exceptions to the rule, and olivine is occasionally found in such highly acid rocks as trachyte, and it is not uncommon as an accessory in andesites. It is sometimes formed in limestones when these have been metamorphosed by heat in proximity to volcanic intrusives.

Chromite is the only commercial ore of chromium, and it must contain at least 50% of the metal to possess a market value. The pure mineral contains 68% of chromium. It is usually massive, and black in color. It also occurs disseminated as grains through the rock. As its specific gravity is moderately high (4.3 to 4.6), it is readily amenable to concentration. This mineral is essentially a constituent of peridotites, and of the serpentines resulting from their alteration. The price at Eastern markets for 50% ore and better, ranges from \$15 to \$20 per long ton.

Heating coal to moderate temperatures, that is, below the boiling point for water, causes the evolution of gases of the paraffin series, such as ethane, propane, and butane. These gases, which make highly explosive mixtures with air in certain proportions, are obtained from anthracite as well as

from bituminous coal. Recent experiments have shown also that these gases are evolved during the crushing of coal. The manner in which the gases are held in the coal is not definitely known. They may exist in the crevices, or may be held intimately distributed through the intermolecular spaces, in a manner analogous to solution.

Pot-roasting is a system of partial desulphurization of ores of lead or copper, by a down-draft through the bed of the ore. It is useful with flue-dust and fine ore for sintering it, thus preparing it for the blast-furnace. This material is dampened and spread over a grate upon a primer of ignited sulphides. The grate constitutes the bottom of a circular receptacle of cast-iron. With lead ores lime is mixed with the charge in proportions varying from 7 to 10%, but that is not needed with copper ores. The lime-roasting of lead ores is employed at many plants, but is by no means universal.

Sulphur in Utah comes from rhyolitic tuffs in Beaver county, which are impregnated by emanations from a fissure which still emits sulphuretted hydrogen. The locality is at Black Rock, where native sulphur is produced to some extent. The rock is mined in a crude way, and the sulphur is then melted out of it in iron retorts, using steam giving a temperature of 144°C . The liquid sulphur is drawn off, and when cooled is ground and sacked for shipment. Louisiana dominates the sulphur market of the world. The imports into the United States have dwindled from 127,996 long tons in 1904, to 19,620 in 1908, the corresponding values being \$2,462,300 and \$318,577.

Cassiterite, tin oxide, may be most easily determined by placing the mineral in dilute hydrochloric or sulphuric acid with granulated, sheet, or shot zinc. A rapid evolution of hydrogen ensues, which reduces metallic tin upon the surface of the cassiterite fragment. The metallic coating is dull gray in color, but becomes bright on rubbing with a soft cloth or chamois-skin. At the same time the peculiar tin odor is emitted, which is so characteristic as to confirm the test. The reaction on which this reduction depends is:



It is more prompt when hydrochloric acid is employed.

Cyanide poisoning cannot be successfully treated by hydrogen peroxide alone. Indeed that substance is of no utility as an antidote except when used by hypodermic injection. It should always be fresh, that which has been previously opened and exposed to the air being useless. Freshly precipitated ferrous oxide given internally is a perfectly efficient remedy if administered promptly. To be ready to prepare this keep on hand two bottles, one containing $7\frac{1}{2}$ gm. ferrous sulphate dissolved in 50 c.c. distilled water, and one of 400 c.c. capacity, containing 250 c.c. of a solution of $1\frac{1}{2}$ gm. caustic soda, and 2 gm. magnesia. Pouring one into the other produces the ferric oxide. After administering, employ a stomach pump. Wedges will be needed to keep the teeth of the patient apart during this treatment.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Co-operative Topographic Surveys.

The Editor:

Sir—May I call attention in your columns to some phases of co-operation in topographic surveys which do not seem to have been considered by George Otis Smith in his letter in your issue of June 19? He says in substance: (1) that the special claims of the public-land States, where the Federal interest in the adequate mapping is paramount by reason of public ownership of land, and (2) that the progress of the topographic map of the United States as a whole, are the two general considerations which must govern the distribution of the topographic surveys in various portions of the United States until specific progress is made in the appropriation for co-operative work.

Let me ask, does public ownership of land necessarily constitute a special claim for a United States Geological Survey contour topographic map of such land? I think not. Do we need contour topographic maps of vast stretches of plain or prairie which are not yet homesteaded, and on which little or no population resides, simply because this land is Government land, as much as we need such maps for thickly settled regions where farming is intensive, and roads are building, where towns exist, mines and quarries are being worked, and where other development and administration problems press? Suppose a given State to contain entirely public land. The adequate mapping of such land would consist of subdividing it for homesteads, surveying its forest boundaries, making appropriate reclamation surveys, and surveying or mapping its rivers and harbors for possible improvements. For all this work the Federal Government has other organizations and appropriations. There would be no population aside from national officials in such a territory to call urgently for the complete maps of the United States Geological Survey, and these completed maps would be paid for by the people of the other States which were refused such surveys because they contained no public land. The appropriations made to the General Land Office, the Forestry Bureau, to the Corps of Engineers of the War Department, and to the Reclamation Service, should care for the paramount Federal interests in the public-land States, leaving the United States Geological Survey to care for the adequate mapping of the more intensely developed regions, be they regions in public-land States or States in which there is no public land whatever.

Supposing in another State the United States owned not an acre. This fact alone would mean a thickly populated country whose citizens needed detailed contour topographic maps for solving their problems of intensive agriculture, of sewerage, and water-supply, of highway, railway, and canal construction, of water-power development, of flood pre-

vention, of mining and quarrying, and of many other projects of urgent need and immediate value. Density of population and intensity of development should be the guiding principles for distributing the topographic surveys of the United States Geological Survey rather than Federal ownership of the soil-rights.

As to the Director's second consideration, the scheme of gradually decreasing allotments suggests the traveler who each day rested after completing one-half of the remainder of his journey. It seems to set up as ideal the completion of the whole United States simultaneously, disregarding the fact that some of these States might be in sore need of a complete map of its area 20 years before the work would be done, and another State might not be in such pressing need until 20 years after. The defects in the proposed scheme are clearly shown when applied to the State of Ohio, where it works a severe hardship, not to say an injustice. In 1900 a representative of the U. S. Geological Survey presented to the general Assembly of Ohio an estimate wherein it was proposed to complete the State survey in 8 years with annual appropriations of \$50,000, divided equally between the State and the United States. Acting upon this, the legislature appropriated the \$25,000 with which to begin the work, and has done so faithfully each year since, expecting to see the State mapped completely by the expiration of 1908. However, owing to a mistake in the estimate, and to welcome improvements in the surveys and maps, under the original scheme Ohio would not have been mapped until 1912, as the cost is averaging about \$15 per mile instead of \$10. But meanwhile the cuts in the appropriation for the topographic branch made by Congress, and above all the new proposed scheme of the Director of the Survey, have deferred the completion to the uncertain future. At this writing there are surveyed only 122 out of the 212 fifteen-minute quadrangles necessary to complete the State survey, and no one can now see the end of the survey, so far as the United States Geological Survey maps concern Ohio, under the new scheme.

Ohio's urgent canal-questions must wait until some State which has its canals yet to build is surveyed; her flood prevention problems must remain unstudied until the survey of some States whose valleys are scarcely yet settled, is nearing completion; her minerals, forests, soils, on which five million people dwell, cannot be studied as a whole until some State with scarcely as many hundred thousand has its domain practically mapped complete.

That the need for a complete map of this State is real and not fancied is illustrated by the work now in progress on the State road-map. The Ohio State Highway Commissioner received from the Legislature last March an appropriation of \$5000, with which to complete before the end of the year a road-map of each county. With about 65% of the actual area of the State surveyed by the United States Geological Survey, only 22 out of the 88 counties are completely covered by those maps, leaving the remainder to be filled in from such meagre other data as can be obtained.

Columbus, Ohio, August 9.

C. E. SHERMAN.

Divergence of Plummet-wires in Deep Shaft-Surveying.

The Editor:

Sir—I beg to say that recently my attention was directed to a discussion in your paper as far back as October 5, 1907, by F. W. McNair, President of the Michigan College of Mines, which had previously escaped my notice. It is a criticism of my article published in your issue of August 25, 1906, upon a quick method for surveying a vertical shaft. The article would be apt to lead one to believe that my survey of the Oneida vertical shaft might contain an abnormal error in azimuth on account of an abnormal divergence of the plummet-wires. The principal object of measuring the distance between the wires was to be sure that they were hanging free as a check upon the examination of their positions in the shaft throughout their entire lengths below the points of suspension.

My survey of the Oneida vertical shaft checked to one minute of arc in azimuth through the 1200-ft. level, and an independent connection previously made through an incline shaft to the surface. Nor was this close check a mere accident. It was due to the special care used in fixing the positions of permanent rest in the vertical plane of the wires on the templates, and in setting the wires thereto with the precision necessary for close practical results, the amount of their divergence being only a secondary consideration. Had this check, which was not mentioned in my original article (as it was not material to the description of the method), not been available, it would then have been necessary for me, under the circumstances, to have repeated the survey for a check, preferably in another compartment of the shaft, as no engineer would be justified in basing the continuation of any such survey on data, the reliability of which he was not sure of.

I have made check surveys using soft-drawn wires and heavy bobs in other shafts in widely separated compartments for the purpose of getting said surveys into as dissimilar disturbing conditions as possible, and have obtained results so close that they did not indicate that air-currents, falling water, and magnetic conditions, appreciably affected the azimuth. This was confirmed by subsequent connections I have made from such surveys. In these check surveys the transit was set up closely to the true vertical plane of the wires, and used to help determine the positions of permanent rest, which in every instance was quickly done.

Another well known refinement may be used, although I have never had occasion to use it, namely, a finely divided scale, to be placed on the template and used in conjunction with the transit in noting the oscillations for determining the position of permanent rest. This, I think, could be done, with extreme accuracy, provided that each bob was heavy enough to sufficiently resist the disturbing influences, particularly those of falling water if in a wet shaft. Ordinarily, the engineer need not dwell too much upon the importance of these disturbing influences, nor always make check surveys to be sure of good results.

A number of years before Mr. McNair experi-

mented in the Tamarack mine with the 'side shot' method of placing the wires, I used it with good results, but have long since abandoned it, except in rare cases, in favor of the 'jiggling in' method, wherein the base between the wires is usually much shorter and in general is only about one-third as long. Notwithstanding that the base is so severely shortened, it is my experience that the advantages are decidedly with the 'jiggling in' method, for with it the engineer can use his transit directly, an impossibility in the 'side shot' method, to assist in setting the wires to their positions of permanent rest and afterward in getting the alignment from them. The alignment is thus obtained with greater precision than is possible with the 'side shot' method, generally enough so, I think, to more than compensate for the severe cut in the base between the wires, particularly since the personal equation of but one man, the engineer, will in common practice affect the accuracy of the operations.

An objection is made that 'jiggling in' is a tedious process, and so it is when the wires are not set at permanent rest, but when they are, the difficulty vanishes, and the alignment may be quickly taken with great precision and a large number of levels quickly, directly, and reliably tied in. In regard to the cause of the abnormal divergence of the plummet-wires two-hundredths of a foot in a depth of 2000 ft. in the Oneida vertical shaft on July 6, 1902. I have come to the conclusion that neither Mr. McNair nor myself were right in our speculations. I now ascribe the cause to the mode of setting the wires in their positions of permanent rest to their respective templates from underneath. This was done by drawing the bobs in opposite directions, substantially within the vertical plane of the wires toward the wall-plates of the shaft, and fastening them thereto, causing said wires to press hard against the templates. As these templates were made from pieces of the soft wood of a candle-box, the wires cut into and forced them apart, changing the settings enough to account for this abnormal divergence. This operation, however, did not, nor could, materially alter the location of the vertical plane of the wires, as all of the pressure exerted against the templates was virtually within said plane, and, therefore, the accuracy of the survey was thereby practically unaffected.

W. E. DOWNS.

Sutter Creek, California, July 31.

Progress in Cyanidation.

The Editor:

Sir—George Mackenzie may reasonably endeavor, in your issue of July 17, to take exception to my conclusions, but can scarcely be justified in objecting to my statement of facts seeing that it absolutely agrees with Mr. Hall's statement, which he includes in his letter although it was omitted from his similar letter to the *South African Mining Journal* of May 29; an omission all the more strange as the charges in the letter were supposed to be based on Mr. Hall's report. The absolute agreement of Mr. Hall's figures with my own is natural as he was the source of my information as to the Ferreira work.

It is obvious from Mr. Hall's report that at the Ferreira, instead of collecting, dissolving, and washing in one vat by one process, Mr. Hall collects in one series of vats, agitates for the purpose of getting the gold into solution in another series of vats, and then transfers to another series (fitted with the Adair-Usher apparatus) for the washing, precisely as I stated. He thus confirms the conclusion to which Mr. Mackenzie takes such strong exception; "the Adair-Usher process thus becomes a method not of solution but of avoiding, with the aid of decantation, a final transfer." As for the claim to avoid the necessity of any settling, Mr. Hall's report is conclusive. I stated that "a flow of solution at the rate of 10 to 12 tons per hour was maintained for a 150-ton charge for 36 hours out of a total treatment time (in the Adair-Usher washing vat) of 72 hours." Mr. Hall is even more conclusive; he states, "the average weight of a charge is 150 tons; in the Usher tank, solution is run through at the rate of 12 tons per hour for 36 hours. Another 36 hours is allowed for settlement, decantation, and discharge." There is no doubt, therefore, as to the settlement. It must be remembered that the Adair-Usher process claimed to be a solution-process as well as a washing process.

As for my conclusions, they may be absolutely mistaken, as may have been also the criticisms on the process in the *Journal of the Chemical, Metallurgical & Mining Society* for July and August 1908, and notably the unanswered criticisms of H. A. White, but whether they are mistaken or not, as the criticisms in my annual Christmas Letter of Progress were never intended for publication (see my protest in the MINING AND SCIENTIFIC PRESS of February 20, 1909), Mr. Mackenzie will, I am sure, acquit me of any desire to prejudice the public against his process.

With your permission I will conclude with an extract from my reply to Mr. Mackenzie's similar letter in the *South African Mining Journal*. "The Adair-Usher people have admittedly worked hard and no one would be more pleased than myself at their reaping so large a pecuniary reward for their efforts as to adequately recompense all concerned; for their efforts have undoubtedly resulted in demonstrating that certain of the existing decantation plants in South Africa were capable of being worked to better advantage."

ALFRED JAMES.

London, August 13.

Platinum and Gold Losses in Dredging.

The Editor:

Sir—Under the heading 'Platinum and Gold Losses in Dredging', in your issue of August 14, the figures of the tests carried out by W. H. James are substantially correct, excepting the "losses per cubic yard of gold and platinum." In your tabulated statement of the tests these equal, and in the latter case far exceed, the original value of the gravel, which was given in fractions of a dollar, instead of in fractions of a cent.

THOS. H. LEGGETT.

New York, August 23.

Waihi Gold Mines.

The Editor:

Sir—From the last annual report of the Waihi company, you will note continued progress; the policy of the company to make a record output each year is being continued, consistent with the best mining, metallurgical, and commercial practice. The ore is also now developed and ready to make further records during this year, 1910, '11, and '12; while not one pound of ore below the 850-ft. level (which is 150 ft. above No. 9, now being opened) has been included in the ore reserves. Already at the 1000-ft. (or No. 9) level it seems clear that the lodes, of which there are 16, are likely to be much stronger than above; the Empire and the Royal, the only two intersected so far, running up to 40 ft. in width, while overhead they did not exceed 20 ft. This widening of the veins with depth has been a feature of the mine for the last four or five levels, and at No. 8 (850-ft.) level the Edward made an enormous lens which at its apex is 95 ft. wide, and averages \$50 per ton for the whole width. There has been nothing better in the mine, though wider stopes are being worked on the Martha lode, also highly payable.

The company conducts its finance on exceedingly conservative lines, and now has liquid cash assets of over \$2,000,000, while every year it writes off about 10% of costs for depreciation of plant; at the same time it also charges an average of \$200,000 for capital expenditure to its revenue account. By this process the book-value of the mine and plant, which cost over \$5,000,000, is written down to \$1,800,000, while the market value of the property stands at over \$22,000,000. The dividends paid to date exceed \$16,825,000, and the return on the investment for some years past has averaged 10% to shareholders, the object being to make the stock a standard investment by extremely even returns.

The mining and milling costs are steadily decreasing, and for 1908 amounted to \$3.95 per ton of 2000 lb. This does not include 30¢ for development. The ore-treatment process is complex, and the plant is probably the most complete of its kind in existence. The ore passes through all the ramifications of rock-breakers, stamps, tube-mills, amalgamating tables, and vanners, to the separate plants for leaching sand, agitation, and vacuum basket-filtration of slime, treatment raw by cyanide, and extremely fine grinding of the concentrate, and final refining of the bullion into pure gold and 0.998 fine silver bars.

A. E. Drucker, a Californian metallurgist, has just spent two or three weeks studying the Waihi mills.

CHAS. RHODES.

Auckland, New Zealand, June 24.

Bromine is chiefly produced from brines in Michigan, Ohio, Pennsylvania, and West Virginia. The output is about 1,000,000 lb. per year, worth about 10¢ per lb. The bromine usually occurs as a bromide of magnesium, the quantity seldom exceeding 2 grams per litre, and in the brines from the Saginaw river field in Michigan, the quantity is often as low as 0.35 gm. per litre. The market is dull, and much of the bromine produced in 1908 remained unsold at the end of that year.

GEOLOGY OF NORTHEASTERN MEXICO.

Written for the MINING AND SCIENTIFIC PRESS
By R. H. BURROWS.

(Continued From Page 294.)

The most striking phenomenon seen in the Las Vigas copper deposits, is their general distribution along the sandstone outcrops. Probably a length of 20 miles along the edge of the beds was passed over, and at every point where the sandstone horizon was visible, considerable copper ore was encountered. This at times would be represented by a mere stain of green carbonate, but the continuity of mineralization was unbroken, showing clearly that the mineral was not limited to any local impregnation as is the case in so many ore deposits. The outcrops of the copper sandstones are found distributed over an area 50 miles long by 12 miles wide, equal to 600 square miles. The mineralization of this formation over such an extensive area is hardly paralleled by the Kupferschiefer of the Mansfeld district in Prussian Saxony. Eruptive agencies, which are generally coupled with the impregnation of metalliferous beds, are nowhere in evidence in the district covered by the Las Vigas formation. Whether the copper may have been originally disseminated through the body of the formation, and subsequently concentrated near the planes of movement, or whether the mineral was introduced into the fissures after the crumpling and slipping of the strata, is a matter of speculation, although the latter hypothesis seems the more probable. Assuming the latter case, the conduits which connected the present mineral-bearing strata with the source of the copper solutions, must have been numerous and widely distributed, as it is hardly possible that the mineralization could have spread over such a wide area from any single source of supply. Directly bearing upon this latter consideration, it may be stated as probable that the copper noticed in the Plomosas formation at Coyamito and Las Plomosas, has been derived from the same source and deposited at the same time as that of the Las Vigas formation.

CUCHILLO FORMATION.

What is undoubtedly the best section of this formation to be seen, is near Cuchillo Parado, on the road from the river to the Aurora mine, where the formation follows a depression in the Cuchillo Parado range. This range is formed by two parallel ridges, the westernmost of which constitutes the outcrop of the Las Vigas sandstones; the other forming the summit of the range, and consisting of the Aurora limestones. Between these two ridges and running throughout the entire length of the range, a considerable depression exists, which is occupied by the beds of the Cuchillo formation, including a thickness of about 2000 ft. The lower 1500 ft. of the formation is an almost pure gypsum, which at the surface breaks into a white sugary mass. A few thin beds of limestone course through the centre of the gypsum, showing quantities of fossil shells. The summit of the formation consists of alternate beds of gypsum and limestone, the latter becoming thicker as they approach the top, gradually passing into the massive limestones of the Aurora formation. At Chorreras

the Cuchillo formation consists almost entirely of clays, gypsum being practically absent. South from Rancho Viejo the ravines which cut through the mesas expose the same formation, consisting here of gypsum and clays, about equally distributed.

At Cuchillo Parado the lower part of the Cuchillo formation contains salt, which leaches out and is carried to the river, where the evaporation of pools often leaves crusts 2 in. thick. The exploitation of salt at this place was at one time an industry that furnished employment for several hundred people, but since the advent of the railroads the salt business has dwindled to almost nothing. Four miles south of the Santa Cristina mine, the Cuchillo formation has been broken through by an intrusion of granite; the clays having been converted into slates and the limestones into marble. These rocks being harder than the surrounding formation rise several hundred feet, in sharp contrast to the continuation of the beds east and west. To the west of the intrusion, a number of small veins have been formed in the metamorphic rocks, in which extremely rich bunches of lead-silver ores have been found near the surface, generally, however, changing into low-grade galena and blende as depth is attained. Perhaps a resource of greater value than either of the above mentioned minerals, is the great quantity of gypsum at Cuchillo Parado, which may become valuable as soon as the opening of railroads affords cheaper transportation.

AURORA FORMATION.

The name of Aurora formation was adopted on account of the magnificent exposure of these rocks near the Aurora mine in the Cuchillo Parado range of which it forms the culminating ridge. The formation as seen at the Aurora mine dips steeply to the east, becoming flatter as it is followed south to the edge of the Chilicote plain, where it then becomes flat and constitutes the bedrock of the plain. West of the Chilicote plain, the formation appears in the Chorreras range, dipping about 50° to the southwest. From here the limestones swing around to the north, crossing the Conchos river at Soldado and continue northward, forming the Sierra del Morrion and the hills around the Hormigas ranch. The outcrop in the Sierra del Morrion is practically vertical, the beds flattening slightly at the base of the mountains, dipping under the valley of Dolores to the west, and rising farther west to form the Sierra de Santa Eulalia, in which occur the famous mineral deposits. North of the Santa Eulalia range the relations of the limestones are rather obscure, but they are seen again north of Aldama, where they rise in the Sierra de La Peña Blanca, outcropping in a bold escarpment facing the east. Dipping to the westward at La Peña Blanca, the formation re-appears in the vicinity of Terrazas and constitutes the matrix of the lead and copper deposits of that camp. West of Santa Eulalia and Terrazas, the limestones almost entirely disappear under the eruptive rocks, and are only seen at infrequent intervals, where the combined forces of upheaval and erosion bring limited areas to the surface. One of these small areas is exemplified in the camp of Minillas, 10 miles northwest of the city of Chihuahua, where the limestone fissures contain lead-silver ores. On the west side of the valley of Cuchillo

Parado, the limestones dip into the San Pedro mountains, and rise again farther west near Las Vigas, the syncline being occupied by the valley of San Pedro. North of Las Vigas, the Coyame mountains are built up of this formation, which also contains great caves, said to rival those in Kentucky. The formation is nearly pure limestone, in thick layers; the entire thickness of the beds varying from 600 to 1500 ft., thicker in the western part of the region than in the eastern. At a few points, notably in the Chorreras range, numerous nodules of flint and iron ore were observed. Fossils are plentiful, but generally so firmly imbedded in the limestone matrix that it is difficult to obtain good specimens. A few fragments of ammonites were found near the base of the beds at Chorreras and several specimens of echinoids at Cuchillo Parado; the majority of fossil organism, however, are bivalves. This formation is probably identical with the Edwards limestone of the Texas Lower Cretaceous, as suggested by Robert T. Hill in articles on Santa Eulalia and Sierra Almoloya.

The Aurora formation contains the most important mineral deposits found in the entire region. Santa

clearly shown at the head of the gulch near the Vergara shaft, where the edges of several hundred feet of limestones have been uncovered by the erosion of the tuffs, showing the existence of an ancient hollow. The limestone must have subsisted for a long time as a land surface, the hollows now filled with eruptive material representing ancient water courses, the debris of which may be seen in the profusion of water-worn limestone boulders that lie on the limestone surface of the San Antonio Chico and other claims in that locality. Over this surface, volcanic outbursts spread an enormous cap of fragmental material filling the depressions and covering the limestones until the later beds of tuff show a uniform bedding independ-



Aurora Mine, and Cuchillo Gypsum.

Eulalia, Naica, Sierra Almoloya, Terrazas, Minillas, and Cuchillo Parado; all lead-silver producers, with some zinc; Jimenez and Terrazas, producing copper and silver, are all contained within these rocks. So much has been written regarding the mineral deposits of Santa Eulalia, and the opportunities afforded the writer in that locality were so limited, that no attempt will be made to enlarge on what has already been so well described. Having occasion, however, to wander over a good part of the camp for the purpose of determining the boundaries of several mining claims, the opportunity was improved to the extent of making an approximate sketch of the surface geology, which is herewith submitted. The Sierra Santa Eulalia lies near the eastern edge of the territory deluged by the igneous material which practically covers the country from this line westward to the western flank of the Sierra Madre. The east side of the Santa Eulalia range shows an appreciable thinning of the eruptive rocks to an edge and they disappear a few miles east of the range. It is observable also that the underlying rock is limestone, the surface of which, prior to the effusion of eruptive material, was extensively eroded, although the bedding remained practically horizontal. This is



Las Vigas Formation, Justicia Mine.

ent of the former topography. At the Picacho Robinson and the Cerro de la Campana, the tuffs are probably over a thousand feet in thickness, the greater part of which, however, in the gulch near Santa Eulalia village, has been removed by erosion. A flow of lava 20 to 50 ft. thick then covered the tuffs, this lava showing as a fringe of massive rock running around the hills to the north and south of the gulch of Santa Eulalia. On the top of the massive rock tuffs were again deposited constituting the highest formation in the district, most of which has been eroded.

During the period of eruptive activity, eastern Chihuahua consisted of a uniform plain surface, sloping gently toward the east, broken at intervals by local eruptions of igneous material, such as that of Sierra Rica. Subsequent to this ensued the folding which formed the Santa Eulalia and other parallel ranges. The same forces that elevated the district contributed to the formation of the ore deposits; the activity of the ore-forming elements probably having their inception with the first orogenic movement. The elevation of the range exposed it again to the ravages of the elements, which have disintegrated and swept away a large part of the overlying igneous

rocks, again laying bare the limestone, and carving out new canyons, often a thousand feet in depth.

At Terrazas, 25 miles north of the city of Chihuahua, the same formation encloses deposits of copper and silver-bearing lead. An intrusion of eruptive rock near the centre of the mineralized area, divides it into two distinctive portions, the southernmost of which contains only copper-silver ores, while that on the north produces only those of lead-silver, the copper and lead being nowhere associated within the district. The two parts of the district also differ from each other, in the fact that the copper mines are dry, while the lead mines are extremely wet. At one of the latter mines, at the time of my visit, it was impossible to make headway against the water with a pump throwing 1500 gal. per minute from a depth of only about 200 ft. The ore being soft, the miners were provided with extra long shovels, working with the water up to their chins and reaching as deep as possible after the ore. Diving suits were not provided, consequently production had to stop until the mine could be equipped with more effective pumping appliance. The copper ores, consisting of carbonates and oxides, are reduced on the spot. The lead ores were shipped to Torreon and El Paso. The ores consist of cave-fillings and metasomatic replacements in the limestone. In the eastern part of the region, near Cuchillo Parado, the Aurora mine is found in the same formation. The deposit follows approximately the bedding of the limestones, being seen to cut diagonally across some of the layers near the surface. Limited in its lateral extent, as far as could be seen, the Aurora deposit occupies a cavity which might have been the conduit of a hot spring. The outcrop is mainly iron oxide, which changes into a silicious lead carbonate within a few feet of the surface. The carbonate becomes purer as the deposit is followed into the ground, the lower workings at the time of my visit, showing ore 19 ft. wide, that averaged 40% lead with 4 oz. silver per ton. A striking feature of the deposit was the occurrence of pockets of wulfenite along the foot-wall containing from a hundred pounds to a ton of the mineral, the greater part of which consisted of beautiful crystal aggregations. In sinking a winze 160 ft., about 25 tons of this mineral had been extracted. The development of this district is retarded by difficulties of transportation; the completion of the Kansas City, Mexico & Orient, however, will bring the railroad line within 30 miles of the district and enable the mines to be operated at a profit.

Before dismissing the subject of the ore deposits of the Aurora formation, mention should be made of the influence of the Chorreras granite at its contact with the limestone. This intrusion, which has been mentioned as interrupting the Cuchillo formation, came up directly under the Aurora limestones, the contact between these and the granite showing for a distance of about two miles. The mineralization on the line of contact was represented by bodies of almost pure crystallized hematite. One such mass was over 400 ft. in length by 30 in width. The limestone within a distance of about 300 ft. of the granite has been metamorphosed into marbles of different shades of color, while the contact displays the usual

phenomena of green and brown garnet with more or less epidote. Amphibole of the variety called 'mountain leather', is also found in the vicinity, and has been turned to practical use by a Mexican mine-owner nearby for the lining of a primitive smelting furnace, which is still being used in the reduction of silver ores.

A fact not generally recognized is that all the important springs of water, wherever found in eastern Chihuahua, break out of the Aurora limestones. The oases of Coyame and Chorreras are fed from these sources, and the lesser springs of Hormigas, Chupadero, and others are in the same formation. Most of these springs exhibit a steady flow independent of the change of seasons. This suggests the possibility of reclaiming parts of the region now uninhabitable, by the development of artesian water. The Chilicote plain, for instance, toward which the limestone dips on all sides, might, instead of being a synonym for drought and starvation, be made to blossom, if the indicated artesian water should be developed. While the limestones, however, furnish channels and reservoirs for the circulation and impounding of water, their cavernous nature in other cases has drained the formation, leaving it almost dry. This is exemplified in the Potosí mine at Santa Eulalia, where shafts and bore-holes have penetrated to a depth of 2100 ft. without finding water. The reverse condition is found at Terrazas, where at a depth of 200 ft. it was practically impossible to exhaust the water.

OJINAGA FORMATION.

This includes the latest sedimentaries of the region, and is limited to the area of the Ojinaga basin, the soft character of the rocks being responsible for the modified topography of the basin, as compared with the outcrops of the surrounding formations, which rise in rugged mountain forms. Comprehending at least 2000 ft. of beds of different character, this formation probably includes the Washita division of the Lower Cretaceous, together with later beds, which may belong to the Upper Cretaceous. The marked unconformability which is generally understood to exist between the Upper and Lower Cretaceous was nowhere observed. Detailed study of these beds will no doubt succeed in connecting them with known formations lying to the northeast. The base of the Ojinaga beds, lying directly on the Aurora formation, is composed of thin-bedded gray limestones, which pass into a succession of shales having a total thickness of about 700 ft. Succeeding the shales, is a sandstone forming a prominent ridge and nearly a hundred feet thick. It contains fossil wood and other fragments of plant remains. The material between this sandstone and the summit of the beds consists of about a thousand feet of alternating clays and sandstones, the latter in thin beds, and not to be confounded with the massive one which lies near the centre of the series. The clays at two distinct horizons were seen to contain large fossil bones. A thin layer of sandstone lying 250 ft. above the massive sandstone, contains an abundance of small shells resembling *Turritella*. About 400 ft. higher in the series, a layer of clay 20 ft. thick was found, which contained numerous limestone nodules, in some places almost entirely made up of shells of *Exogyra*.

Fifty feet above this shell-layer another bed of clay showed numerous ammonites and nautili, many being extremely good specimens. This series of beds has attracted attention during the last three years as a possible source of oil, drilling for which is in progress at the present time. Cement materials occur in abundance within the formation. A slight amount of prospecting has been done for coal, but the largest seam found so far is less than a foot in thickness.

CONCHOS GRAVELS.

Occupying areas much greater than those indicated on the map, and representing accumulations of débris resulting from the erosion of the surrounding country, these gravels were carried into the lakes and there subjected to sorting and re-distribution, the gravels being found in fairly uniform beds, in which the boulders seldom exceed a foot in diameter. Calcareous waters percolating through the gravels have cemented them into a material resistant to erosion, as shown by the banks of the Conchos river,

also forming the hills around the Guadalupe placer. At Santa Eulalia the Aurora limestone has been covered with a considerable thickness of tuffs, as described in a former paragraph. Dikes of eruptive rock are common in the eastern and western part of the region, but in the central part are only seen in the Santo Domingo range. They occur in the Boquilla as an andesitic intrusion over 400 ft. thick, and continuing northward in the shape of a dike for nearly five miles. This andesite is in marked contrast with the dike-rocks near the Rio Grande, which are uniformly basaltic, and those of the western part, which are dacites or rhyolites. The Cerro del Coronal and Nombre de Dios near the city of Chihuahua are mainly composed of a thick sheet of dacite dipping to the west. A thin sheet of this material may be seen interbedded with the fragmental rocks in the hills overlooking Santa Eulalia, probably representing the edge of the lava flows eastward. The southern extension of the Santa Eulalia range is entirely



Santo Domingo Placer, Conchos Gravels.

where abrupt escarpments, nearly 200 ft. in height, consist entirely of the cemented gravel. Near the village of Santo Domingo, at a point where the cemented gravels have been disintegrated, small placers have been worked by the natives for a long time; probably for the last hundred years. A few years ago an American company subscribed a large capital for the systematic exploitation of the gravel, establishing a powerful pumping plant in connection with a steam-shovel for handling the material on a large scale. The steam-shovel, however, was insufficient to cope with the cemented gravel, and the enterprise has lain idle for some time, but is expected to start again on an area of disintegrated material that has been proved by late prospecting.

Eruptive rocks are of minor importance in the region of eastern Chihuahua, and are not found to any great extent until the line of the Mexican Central railway is approached, where the outlying edge of the Sierra province is reached. Near Hormigas, directly west of the ranch house, a line of low hills between Hormigas and the Aldama plain is composed of andesitic tuff-breccia, the same character of rocks

composed of massive eruptives, mostly dacite. Near the Rio Grande, numerous dikes of basalt, which can be traced for miles, break through the sedimentaries. About five miles northeast of the Nogal ranch a basaltic cone rises through the Ojinaga beds, the latter dipping away in all directions from the cone.

In striking contrast to all other eruptives of the region, the small intrusion of granite on the Chorreras ranch is interesting. This has been spoken of before in connection with its effect on the Cuchillo and Aurora formations; the sedimentary rocks having been metamorphosed to a considerable distance from the granite. The granitic facies is best observed near the centre of the mass, the structure becoming porphyritic as the edge is approached. The few small veins of silver-bearing galena west of the granite area, and the bodies of iron ore lying between the granite and the marble of the Aurora beds, doubtless owe their origin to this intrusion.

Concrete piles cost from 75c. to \$1.50 per lineal foot; the steel encased variety being considerably more expensive.

BLASTING DEEP HOLES.

Written for the MINING AND SCIENTIFIC PRESS
By O. H. PACKER.

There are many cases where it is more advantageous and less expensive to drill deep holes and blast with large charges of powder than to drill and blast a comparatively larger number of shallow holes. Theoretically, the amount of rock broken is in proportion to the cube of the depth of the hole, and the amount of powder used is in proportion to the square of the depth. For example, a 12-ft. hole would require $4^2=16$ times as much powder as a 3-ft. hole, but it would break $4^3=64$ times as much ground. That is, the 12-ft. hole would be about three times as efficient as three 3-ft. holes. Of course, theoretical results are seldom reached in practice, but more work can be done with deep than with shallow holes in any case, all expenses considered. If a hole be drilled too deep, however, enough powder can not be charged in it for proper blasting. In such a case the hole is only 'sprung'.

Deep-hole blasting is especially advantageous in making railroad cuts, or in grading for buildings, piers, and the like. The method to be pursued in drilling and blasting deep holes will depend upon the nature of the rock, the depth of the holes, and the number of holes to be drilled. When a large amount of rock is to be removed, either power-driven churn-drills or common 'Burleigh' drills will be most economical. If only a small amount of work is to be done, especially in soft rock, hand churn-drilling will be found most economical. The latter can often be used where the ground is too rough to move a power-rig. In any case, except where a power churn-drill is used, there is not enough room at the bottom of a deep hole for the required amount of powder, making it necessary to 'spring' the hole. To do this, proceed as follows: drop in the hole from three to five sticks of dynamite, tamping each stick with a wooden tamping-rod. Mark the tamping-rod to indicate the distance from the top of the charge to the surface. The primer, with a 2 to 3-ft. lighted fuse is dropped in. Water is usually the best tamping when springing holes, though clay may be used, especially with the last springing charge. All rock is capable of more or less compression, therefore, the detonation of the dynamite produces a cavity or pocket at the bottom of the hole by compressing the surrounding rock.

Unless the rock be soft, or the hole shallow, additional springing will be required to make the cavity at the bottom large enough to contain the charge for blasting. Deep holes in hard rock require 'springing' three or four times, and sometimes as many as 80 sticks of dynamite are used in the last 'springing' charge. The amount and grade of dynamite to be used in 'springing' and in blasting must be ascertained by trial. Experience is a good teacher, but it is advisable for even the experienced workman to experiment with different grades of dynamite every time a new piece of work is begun. In soft rock 'springing' is done with a low grade of dynamite. In hard rock the strongest grade is used.

The blasting is usually done with black powder except in wet ground, when a low grade of dynamite is better. Dynamite is suitable for 'springing' because the entire charge detonates at practically the same instant, thus shattering the rock in the immediate vicinity of the charge. Black powder is suitable for blasting deep holes because it is slow in action and gives time for its force to be transmitted a greater distance from the charge than dynamite. Some dynamite is made that contains only 25% nitroglycerine, and is almost equivalent to black powder in its action. This low-grade dynamite is, therefore, suitable for use, in place of black powder in wet holes. If the holes be drilled with a power churn-drill, 'springing' will not be necessary, as the holes are large enough to hold the charge.

In any case more effective blasting can be done by using an electric blasting-machine, so as to fire a number of holes at the same time. A blasting machine is simply a small dynamo for generating electricity. It is light, and may easily be carried from place to place in the hand. Just before connecting up the machine for a blast it is advisable to 'short circuit' it by connecting its positive and negative poles with a piece of copper wire so as to discharge any residual charge that might be in the machine. Such a residual charge might set off a few holes and thus necessitate wiring up the remaining holes again. Such a premature blast might also injure or kill some of the workmen. Use a strong blasting machine, and never try to blast more holes than the machine is designed to fire. Powder loaders, consisting of a funnel and a long stem, may be used to good advantage in loading with black powder. When starting a hole through gravel, or any kind of ground that has a tendency to cave, drop clay into the hole at regular intervals during the drilling to form a clay wall or casing around the hole.

The life of almost any wood can at least be doubled by thorough impregnation with creosote or zinc chloride. This means a great saving in the original cost of the timbers and in the labor of replacing them. Cheap woods when well treated are improved so as to possess many qualities of the valuable and naturally durable kinds, and will last longer than those which are naturally durable but untreated. Thus cottonwood, willow, spruce, lodgepole pine, or jack pine can be used in place of cedar for posts; birch, hemlock, or tamarack in place of oak for ties; lodgepole pine in place of cedar for poles. In every case the treated substitute will last longer than the wood commonly used, and will cost less. The Bunker Hill & Sullivan Mining & Concentrating Co., of Kellogg, Idaho, and the Hercules Mining Co., of Burke, Idaho, last year obtained the assistance of the Forest Service in designing and building treating plants. The Forest Service furnished an engineer in wood preservation to take charge of the plants until employees of the companies had become familiar with the work, the companies paying the expenses. The plants are now being run by the companies themselves. Anyone so desiring can obtain similar co-operation by application to the District Foresters.

ACCURACY IN ASSAYS AND ANALYSES.

Written for the MINING AND SCIENTIFIC PRESS

By JAMES W. HOWSON.

The degree of accuracy which must be attained in assaying and analytical work in order to secure satisfactory results is difficult to state definitely. Much will depend upon the value of the material to be assayed or upon the importance of the assay to the work in hand. There are many minor considerations involved, such as the thoroughness and correctness of taking the sample, the composition of the sample itself, the quantity of the element which is to be determined, the methods employed in the analysis, etc. Generally in analytical work on ores and similar products, duplicates should check within 0.20 or 0.30%. In volumetric work, since the difference of a drop of the standard solution makes a considerable difference in the results, unless the solution be very weak, it will frequently happen that the duplicates check exactly. The following table contains results in duplicate of most of the elements usually determined in ore analyses. Unless otherwise stated the material examined was an ore.

ASSAYED FOR ANTIMONY (Sb).

| Sample. | Per cent. |
|---------|-------------------|
| *1..... | 0.18—0.36 |
| *2..... | 0.72—0.90 |
| †3..... | 41.88—41.64—41.76 |
| 4..... | 4.74—4.82 |
| †5..... | 38.40—38.88 |
| 6..... | 9.96—9.70 |
| 7..... | 17.52—17.64 |
| †8..... | 27.84—28.20 |

*Determined volumetrically with standard iodine solution, fusing in the case of oxidized ores (cervantite).

†Stibnite.

‡Cervantite.

ASSAYED FOR ARSENIC (As).

| Sample. | Per cent. |
|---------|-----------|
| 1..... | 2.72—3.02 |
| 2..... | 2.66—2.56 |

Determined volumetrically with ammonium thiocyanate solution.

ASSAYED FOR BISMUTH (Bi).

| Sample. | Per cent. |
|---------|-------------|
| 1..... | 0.34—0.36 |
| 2..... | 47.28—47.78 |

Precipitated as carbonate and ignited to the oxide.

ASSAYED FOR CHROMIUM (Cr).

| Sample. | Per cent. |
|---------|-------------|
| 1..... | 27.10—27.54 |

Chromite fused with sodium peroxide in a nickel crucible.

ASSAYED FOR COPPER (Cu).

| Sample. | Per cent. |
|----------|-------------|
| *1..... | 0.17—0.83 |
| *2..... | 3.52—3.50 |
| *3..... | 14.25—14.21 |
| *4..... | 9.57—9.55 |
| †5..... | 5.38—5.38 |
| †6..... | 1.33—1.39 |
| †7..... | 1.88—1.88 |
| †8..... | 0.64—0.58 |
| †9..... | 19.71—19.84 |
| †10..... | 2.89—3.79 |
| 11..... | 3.53—3.54 |
| †12..... | 3.00—3.02 |
| 13..... | 1.90—1.85 |

*Iodide method.

†Cyanide method. A difference between duplicates of 0.20% is not to be passed under ordinary circumstances.

‡Electrolytic method.

ASSAYED FOR IRON (Fe).

| Sample. | Per cent. |
|---------|-------------|
| *1..... | 25.70—25.90 |
| *2..... | 22.59—22.74 |
| *3..... | 3.83—3.83 |
| *4..... | 20.08—20.08 |
| *5..... | 38.37—38.47 |
| †6..... | 47.53—47.32 |
| †7..... | 15.71—15.50 |

*Volumetric bichromate and permanganate methods.

†Slags.

ASSAYED FOR LEAD (Pb).

| Sample. | Per cent. |
|---------|-------------|
| 1..... | 45.10—44.80 |
| 2..... | 28.56—28.50 |
| 3..... | 7.85—7.65 |
| 4..... | 6.85—7.05 |
| 5..... | 9.00—9.10 |
| 6..... | 66.80—66.30 |
| 7..... | 16.38—16.48 |

Wet ammonium molybdate assays.

ASSAYED FOR LIME (CaO).

| Sample. | Per cent. |
|---------|-------------|
| 1..... | 2.99—3.04 |
| 2..... | 38.67—38.97 |
| 3..... | 51.35—51.45 |

Volumetric permanganate titration.

ASSAYED FOR MOLYBDENUM (Mo).

| Sample. | Per cent. |
|---------|-----------|
| 1..... | 2.97—2.54 |

Volumetrically with lead acetate solution.

ASSAYED FOR MANGANESE (Mn).

| Sample. | Per cent. |
|---------|-------------|
| 1..... | 54.40—54.76 |
| 2..... | 14.34—14.31 |
| 3..... | 5.21—5.14 |

Permanganate titration.

ASSAYED FOR MERCURY (Hg).

| Sample. | Per cent. |
|---------|----------------|
| 1..... | 0.11—0.10—0.08 |
| 2..... | 0.60—0.55—0.53 |
| 3..... | 0.04—0.06 |
| 4..... | 32.60—32.80 |
| 5..... | 27.05—27.60 |
| 6..... | 29.80—29.80 |
| 7..... | 36.40—36.60 |
| 8..... | 2.44—2.39 |

Eschka's method, using Whitton's apparatus. On low-grade mercury results should check to within a few hundredths of one per cent.

ASSAYED FOR SILICA (SiO₂).

| Sample. | Per cent. |
|---------|-------------|
| *1..... | 74.80—75.60 |
| *2..... | 6.30—6.30 |
| †3..... | 36.80—36.70 |
| †4..... | 27.80—28.00 |
| †5..... | 67.50—67.06 |
| †6..... | 7.00—7.02 |

*Insoluble gangue.

†Slags.

‡Fused.

ASSAYED FOR SULPHUR (S).

| Sample. | Per cent. |
|---------|-------------|
| 1..... | 45.30—44.95 |
| 2..... | 6.30—6.30 |

ASSAYED FOR ZINC (Zn).

| Sample. | Per cent. |
|---------|-------------|
| 1..... | 44.10—44.50 |
| 2..... | 15.14—15.00 |
| 3..... | 1.17—1.22 |
| 4..... | 21.35—21.40 |
| 5..... | 4.50—4.50 |
| 6..... | 31.45—31.50 |
| 7..... | 8.89—8.94 |

A. H. Low's method.

| ASSAYED FOR TELLURIUM (Te). | |
|--|------------|
| Sample. | Per cent. |
| 1..... | 2.08— 2.42 |
| Precipitated gold with FeSO ₄ , and tellurium in the filtrate with sulphurous acid. | |

The analyses which follow illustrate partial or complete analyses, in which the separation of the elements play, as a rule, a more important part than in simple determinations. It will be seen that, except in the more complicated separations, duplicate analyses agree quite as closely as in single determinations, that is, usually within 0.20 or 0.30%. Unless otherwise noted the lime, iron, and lead were determined volumetrically, and the alumina by difference.

| GYPSUM. | |
|---|-------------|
| Assayed for | Per cent. |
| Limestone (CaO) | 33.42—33.27 |
| Sulphuric acid (SO ₃) | 47.26—47.26 |
| Calculating the lime to CaSO ₄ .H ₂ O gives 91.68% gypsum. | |
| Calculating the sulphuric acid to CaSO ₄ .H ₂ O gives 90.97% gypsum. This affords a good check to the work. | |

| LIMESTONE. | |
|--|-------------|
| Assayed for | Per cent. |
| Insoluble gangue | 5.64— 5.64 |
| Ferric oxide (Fe ₂ O ₃) | 0.29— 0.29 |
| Alumina (Al ₂ O ₃) | 0.23— 0.23 |
| Lime (CaO) | 39.65—39.50 |
| Magnesia (MgO) | 10.44—10.87 |

| LIMESTONE. | |
|---|--------------|
| Assayed for | Per cent. |
| Silica (SiO ₂) | 7.70— 7.40 |
| Ferrous carbonate (FeCO ₃) | 3.09— 3.28 |
| Alumina (Al ₂ O ₃) | 0.66— 0.22 |
| Calcium carbonate (CaCO ₃) | 88.48—88.39 |
| Magnesium carbonate (MgCO ₃) .. | 0.38— 0.38 |
| | 100.31—99.67 |

| LEAD ORE. | |
|------------------------|-----------------|
| Assayed for | Per cent. |
| Insoluble gangue | 1.52— 1.70 |
| Iron (Fe) | 0.30— 0.20—0.20 |
| Zinc (Zn) | 10.47—10.57 |
| Lead (Pb) | 69.12—69.32 |
| Sulphur (S) | 16.45—16.37 |

| COPPER MATTE. | |
|----------------------------------|-------------|
| Assayed for | Per cent. |
| Silica (SiO ₂) | 1.54— 1.80 |
| Lead (Pb) | 1.47 |
| Copper (Cu) | 52.00 |
| Iron (Fe) | 20.22—20.14 |
| Lime (CaO) | 0.25— 0.25 |
| Sulphur (S) | 21.80—21.94 |

| CLAY. | |
|--|-------------|
| Assayed for | Per cent. |
| Silica (SiO ₂) | 58.00—58.20 |
| Iron oxide (Fe ₂ O ₃) | 4.43— 4.43 |
| Alumina (Al ₂ O ₃) | 17.05—17.05 |
| Lime (CaO) | 1.93— 1.93 |
| Magnesia (MgO) | 1.45— 1.52 |
| Soda (Na ₂ O) | 2.02— 1.90 |
| Potash (K ₂ O) | 2.36— 2.60 |
| Loss on ignition | 13.40 |
| | 100.64 |

| MANGANESE ORE. | |
|--|-------------|
| Assayed for | Per cent. |
| Silica (SiO ₂) | 19.62—20.04 |
| Ferric oxide (Fe ₂ O ₃) | 4.39— 4.39 |
| Alumina (Al ₂ O ₃) | 3.34— 3.13 |
| Manganese dioxide (MnO ₂) | 66.47—65.60 |
| Manganese oxide (MnO) | 4.72— 4.78 |
| Lime (CaO) | 0.52— 0.52 |

| MANGANESE ORE. | |
|--|-------------|
| Assayed for | Per cent. |
| Silica (SiO ₂) | 2.56— 2.60 |
| Iron (Fe) | 0.96— 0.96 |
| *Alumina (Al ₂ O ₃) | 6.86— 6.94 |
| Manganese (Mn) | 42.38—42.38 |
| Baryta (BaO) | 12.73—13.38 |
| Lime (CaO) | 5.70— 5.90 |
| Strontia (SrO) | 10.93—11.50 |
| Carbon dioxide (CO ₂) | 4.00— 4.00 |

*Direct pp. as the phosphate.

Usually in careful analytical work it is customary to have the analyses, or at least a portion of them, checked. Where the analysts' duplicates check closely, and the work has been carefully done, it will be found that the results obtained by a second analyst generally agree closely with the results of the first, provided the accuracy of the methods used by both is well established. The checking of work serves several purposes. It guards against the inaccuracy of the inexperienced analyst, while the inexperienced man engaged in routine work is less liable to slur over the fine points of his analysis, or to make any dangerous short-cuts, if he knows that his work is likely to be checked. Where extreme accuracy is required the average of the results of several analysts is usually more reliable than any individual result. The following results illustrate what has been said above:

| COPPER MATTE. | |
|---------------------------------|-------------------------|
| Assayed for | Per cent |
| | Assayer A. Assayer B. |
| Copper (Cu) | 56.54—56.30—56.30 56.32 |
| Copper (Cu), original sample... | 50.24—49.93 } 50.60 |
| Copper (Cu), duplicate sample.. | 51.09—51.14 } |
| Average | 50.00 |

| MERCURY ORE. | |
|--------------------|---|
| Assayed for | Per cent |
| | Assayer A. Assayer B. Assayer C. Assayer D. |
| Mercury (Ag) | 3.62 3.65 5.5 3.71 |
| Mercury (Ag) | 0.27 0.28 0.3 0.36 |
| Mercury (Ag) | 1.375 1.37 *0.5 1.36 |
| Mercury (Ag) | 0.02 0.04 Trace. 0.06 |

*Erroneous.

Assayers A, B, and D used Eschka's method with silver foil; assayer C used the electrolytic method.

| CEMENT. | |
|--|-----------------------|
| Assayed for | Per cent |
| | Assayer A. Assayer B. |
| Insoluble (SiO ₂) | 21.36— 21.20 21.12 |
| Iron and aluminum oxides (Al ₂ O ₃ , Fe ₂ O ₃) | 10.90— 11.30 11.20 |
| Lime (CaO) | 61.42— 61.82 61.51 |
| Magnesia (MgO) | 1.85— 1.96 1.91 |
| Sulphuric acid (SO ₃) | 1.88— 1.81 1.64 |
| Loss on ignition | 1.00— 1.04 2.40 |
| Undetermined | 1.59— 0.87 0.22 |
| | 100.00—100.00 100.00 |

In the above analyses either Assayer A underheated in determining the loss on ignition, or Assayer B experienced some mechanical loss. Both analysts used the standard method of analysis as adopted by the American Society of Civil Engineers, with a few individual variations to hasten the work.

Though much has been written concerning the care which should be exercised in order to secure accuracy in chemical analysis and assaying, there is but little literature on the subject that states empirically the limits of error in the work, for the ex-

cellent reason that such limits vary, and as has been said before are difficult to state definitely. According to Ernest H. Simonds* the limit of error cannot be stated to be invariably a certain percentage of the amount of the metal present, because the accuracy varies greatly according to the material to be assayed. For silver bullion the fire-assay may be relied upon to within about two one-thousandths (0.2%) of the content, although greater accuracy may be obtained with a proof-centre, using silver 1000 fine, or United States coin silver (900 fine), where the silver bullion is approximately that fine. If a possible error of two one-thousandths is too great, the wet assay should be used. For gold bullion, assays should agree to within one-half of a thousandth (0.05%), and generally they do agree to within one four-thousandth (0.025%). The sur-charge found by means of a check of proof-gold is usually four to seven-tenths of a thousandth. The following table gives actual results obtained. Bars 1 and 2 are mill-gold or retorted amalgam, from the battery and plates of a California stamp-mill. Bars 3 and 4 are cyanide-bars, obtained by melting the gold-sludge formed by acid refining of the zinc-box precipitate in a cyanide plant; hence the base metal zinc is present. In bars 5 and 6, most of the base metal is lead. Bar 7 is base silver bullion from Mexico. The seller used the fire-assay, the buyer the humid-assay for silver.

| Bar. | Weight, | | Seller | | Buyer | |
|--------|---------|---------|--------|---------|--------|---------|
| | oz. | Sample. | gold. | silver. | gold | silver. |
| 1..... | 225 | Dips | 722.25 | 268 | 722½ | 265 |
| | | | 722.30 | 267 | ... | ... |
| 2..... | 50 | Chips | 713.65 | ... | 714 | ... |
| | | | 713.88 | ... | ... | ... |
| 3..... | 600 | Borings | 603.25 | 333½ | 602½ | 330 |
| 4..... | 600 | Borings | 603.00 | 333 | ... | ... |
| | | | 607.00 | 334½ | ... | ... |
| | | | 607.25 | 335½ | 607½ | ... |
| 5..... | | Dips | 81.00 | 595 | 81 | 594 |
| | | | 81.02 | 595½ | ... | ... |
| 6..... | | Dips | 84.34 | 593½ | 84.2 | 591 |
| | | | 84.35 | 592½ | ... | ... |
| 7..... | 780 | Dips | 0.04 | 314.86 | Trace. | 316 |
| | | | 0.04 | 314.76 | ... | ... |

For silver sulphide precipitates, an assayer's duplicate assays should agree closely, within 30 oz. per ton, or 0.1%, on account of the homogeneity of the pulp. By the uncorrected fire-assay, that is, neglecting the slag and cupellation-loss, the following results were obtained:

| Assayer. | Method. | Gold, | | Silver, | |
|----------|-----------|-------|--|---------------|--|
| | | oz. | | oz. | |
| A | Crucible | 29.90 | | 11,293 | |
| A | Scorifier | 30.00 | | 11,278-11,308 | |
| B | Scorifier | ... | | 11,323 | |

In copper mattes the material is perfectly homogeneous, and easy to sample, and hence it is easy to obtain duplicate assays from it agreeing closely. The following table gives the results on 'shipping matte' from three different furnaces in widely separated districts:

| —Seller— | | | —Buyer— | | | —Umpire— | | |
|----------|-------|-------|---------|-------|-------|----------|------|-------|
| Au, | Ag, | *Cu, | Au, | Ag, | Cu, | Au, | Ag, | Cu, |
| No. oz. | oz. | % | oz. | oz. | % | oz. | oz. | % |
| 1.. | 9.85 | 64.20 | 34.23 | 9.84 | .... | 34.00 | .... | 65.29 |
| 2.. | 16.47 | 91.20 | 50.15 | 16.47 | 91.70 | 49.90 | .... | .... |

*"The Accuracy of Commercial Samples and Assays." The California Journal of Technology, November 1903.

| | | | | | | | | | |
|-----|-------|--------|-------|-------|-------|-------|-------|--------|--------|
| 3.. | 11.97 | 73.74 | 28.67 | 11.83 | 74.50 | 28.70 | 12.00 | 72.80 | .... |
| 4.. | 13.39 | 69.20 | 35.65 | 13.33 | 69.80 | 36.90 | 13.33 | .... | 35.80 |
| 5.. | 30.03 | 285.95 | 49.25 | .... | .... | 49.30 | 30.04 | 286.90 | †50.24 |
| 6.. | 1.28 | 41.26 | 52.20 | 1.24 | 41.35 | 52.30 | .... | .... | .... |
| 7.. | 1.45 | 35.15 | 55.70 | 1.47 | 35.30 | .... | .... | .... | 55.77 |
| 8.. | 1.37 | 34.51 | 48.74 | 1.32 | 33.16 | .... | .... | .... | 48.73 |

*These copper analyses were made by myself by the iodide method.

†Used battery method, and evidently forgot to subtract the silver.

In 1, 2, 3, and 4 the buyer determined the gold and silver by scorification, and the copper by electrolysis; the seller used the crucible assay for the gold and silver, and the iodide method for the copper. In 5 both buyer and seller used the crucible assay for the gold and silver, and the iodide method for the copper. In 6, 7, and 8 the seller used the scorification method with re-scorification of the buttons for the gold and silver, and the buyer used the crucible method; both used the iodide method for the copper. In 1, 2, 3, and 4 the contract between buyer and seller provided that an umpire assay should be made provided the assays varied more than 0.25% for the copper, 1 oz. for the silver, and 0.05 oz. for the gold.

In pyritic concentrates umpire assays are not generally made unless the values given by two assayers vary more than 0.05 oz. gold per ton, provided that the value of the lot figured from the results of the two assayers differs by less than \$20, or provided the variation is less than 1% of the total value of the lot.

Silver-lead ore and concentrate, the easiest of materials to sample, give perfectly uniform results. In the following table, 1 and 2 are from Idaho, and 3 and 4 from Mexico:

| No. Sample. | —Seller— | | —Buyer— | |
|-------------------|----------|-------|---------|--------|
| | Ag, oz. | Pb, % | Ag, oz. | Pb, %. |
| 1 | 67.5 | 63.2 | 69.4 | 62.8 |
| 2 | 72.4 | 64.5 | 72.8 | 64.3 |
| 3 | 311.00 | 36.3 | 312.50 | 36.5 |
| 4 Original | 230.50 | 30.2 | .... | ... |
| 4 Duplicate | 239.30 | 31.1 | .... | ... |
| 4 Average | 234.90 | 30.65 | 235.50 | 30.75 |

In checking samples, results show that they are correct to within about 2% of the total amount of the metal present.

| COPPER MATTE. | | | |
|-----------------|---------|---------|-------|
| | Au, oz. | Ag, oz. | Cu, % |
| Original | 35.50 | 342.0 | 52.72 |
| Duplicate | 35.64 | 337.6 | 52.78 |

| PYRITIC CONCENTRATE. | | | |
|----------------------|---------|---------|---------|
| | Seller. | | Buyer. |
| | Au, oz. | Ag, oz. | Au, oz. |
| First sample | 7.07 | 27.50 | 7.17 |
| Re-sample | 7.29 | 28.05 | 7.16 |

| No. of samples. | Highest. | | Lowest. | | Average. | | Composite. | |
|-----------------|----------|---------|---------|---------|----------|---------|------------|---------|
| | Au, oz. | Ag, oz. | Au, oz. | Ag, oz. | Au, oz. | Ag, oz. | Au, oz. | Ag, oz. |
| 102 | 1.10 | 47.40 | 0.02 | 0.25 | 0.213 | 6.79 | 0.225 | 6.70 |
| 16 | 0.40 | .... | 0.09 | ... | 0.204 | ... | 0.21 | ... |

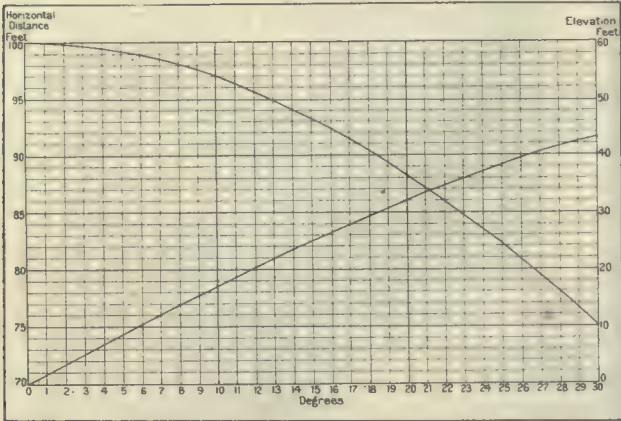
In checking ore tests the total value ought to foot up to within 2 or 3% of that given by the assay of the ore pulp.

Bromo-cyanidation is not at present employed in any important plants in the United States. The chemicals required can be obtained from leading supply houses, or can be made readily on the spot.

ACCURACY IN SURVEYING.

Written for the MINING AND SCIENTIFIC PRESS
By LEE FRASER.

An important phase in both surface and underground surveying, but with special reference to the latter, is that phase dealing with the required accuracy and proportionate error of the work. It will be presumed that a standard for accuracy has been established, and that it is only sufficiently good for the purpose. It is impossible to do work without error, and a full appreciation of the nature, relative size, and weight of such errors, together with an idea of the cost for decreasing them, is of the



utmost importance for the performance of the work with least labor, yet, at the same time, maintaining a degree of accuracy equal to the standard.

Perhaps one of the most common errors made by engineers, working to any certain standard of accuracy, namely, 1-5000, is the consideration they bestow upon the measurement of horizontal distances greatly in excess of what is required for the purposes of the survey. Upon consideration of the accompanying figure, together with the following table, the data required to regulate the survey for the best performance with reference to any standard may readily be secured.

| LIMITS OF ERROR. | | | | | |
|------------------|--------------------------------|--|--|--------------------|------------------------------|
| De- gree. | Vertical Displace- ment. | Decrement in Horizontal Displace- ment per 100. | Error in Measurement Plus or Minus. | Final Error. | |
| 1..... | 1.7452 | 0.015 | $\frac{1}{6666}$ | $\frac{1}{20,000}$ | $\frac{1}{10,000}$ 5000 |
| 2..... | 3.4900 | 0.061 | $\frac{1}{1639}$ | $\frac{1}{20,000}$ | $\frac{1}{1785.7}$ 1515.1 |
| 3..... | 5.2336 | 0.137 | $\frac{1}{730}$ | $\frac{1}{20,000}$ | $\frac{1}{757.5}$ 704.2 |

RADIUM ORE.

The discovery of radium ore in the United States is the object of a movement started by Thomas F. Walsh, of Colorado. Through the Vinson-Walsh research department of the Colorado State School of Mines at Golden, which is supported by Mr. Walsh, tests will be made of all samples of pitchblende free of cost, and the results will be regarded as confidential. To meet the preliminary cost of the undertaking, Mr. Walsh sent to Victor C. Alderson, president of the School of Mines, a check for \$5000. In his communication to Mr. Alderson, he makes the following appeal to the prospectors of Colorado and the United States: "Radium has never been produced in the United States. It comes from pitch-

blende, and is of most priceless value. Austria has a monopoly on this ore. Why should we not produce it in Colorado? The richest prize in the mining world is a vein of pitchblende ore. This rare ore is apt to be found in many mining districts of the State. In finding it you will be enriching yourself, placing your State in the front rank, and helping to open a new industry in mining. The undersigned trustingly appeals to his brother prospectors and mine operators to look for this mineral. He believes the doing so will bring great results." Mr. Alderson stated that to a limited extent the School is ready to furnish responsible persons samples of pitchblende to aid in familiarizing prospectors with its appearance.

Copper production in Russia has been steadily increasing, as is shown by figures furnished by Hunter Sharp, Consul General of the United States at Moscow. The production amounted to 10,306, 14,554, and 16,591 tons in 1906, 1907, and 1908, respectively. The production in the several districts in 1908 were as follows, in tons: Ural, 8429; Caucasus, 4780; Siberia and Kirgis, 2416; all other districts, 966. The consumption of copper in Russia in 1908 was as follows: Produced in the empire, 16,478 tons; imported, 4855 tons; total, 21,333 tons, less 113 tons exported.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

J. H. P., Golconda, Nevada; Gabbro.

A. B. C., Battle Mountain, Nevada: Black basalt containing some pyrite.

A. H. A., Rhyolite, Nevada: Black limestone intersected by veins of chalcedony and calcite.

M. D., of Yerington, Nevada: No. 1, pyrite and a little chalcopyrite; No. 2, feldspar-porphry; No. 3, pyrite; No. 4, yellow serpentine on limestone; No. 5, granite; No. 6, porphyrite; No. 7, syenite.

J. R. L., Dunsmuir, California: No. 1, the three specimens of this number are serpentine dike rocks and could be originally basalt or diabase; No. 2, quartzite; No. 3, a serpentine-feldspar-quartz rock, possibly an altered rhyolite or andesite.

J. H. T., Fallon, Nevada: No. 1, diabase; No. 2, metarhyolite; No. 3, quartz with galena, pyrite, and earthy limonite formed by the alteration of the pyrite; No. 4, altered andesitic rock; No. 5 and 6, metamorphic schistose rocks, perhaps changed andesite or rhyolite.

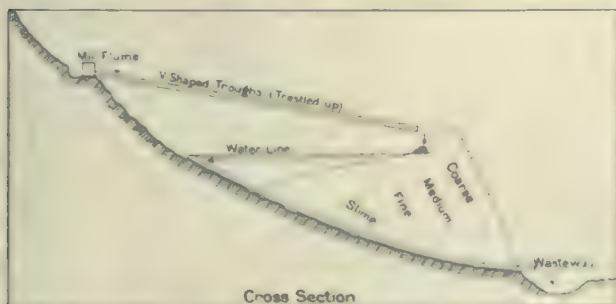
A. T., Auburn, California: No. 1, a mineralized hornblende-diorite containing pyrite and some chalcopyrite; colors are due to slight iridescent tarnish; taste may be due to alteration of the sulphides; No. 2, quartz with pyrite; No. 3, quartz with pyrite. The specimens are of no value.

IMPOUNDING MILL TAILING.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. MACFARREN.

The impounding of mill tailing has usually one or more of three purposes in view: to restrain the tailing from reaching watercourses or places where not desired; to impound for future treatment; and to permit of pumping back part of the water for re-use in the mill.

For the pond, a convenient site is selected requiring the smallest length of bank building. A hill for one side is desirable. The flume conveying the tailing from the mill may be carried along the contour of the hill, and as high up as it is intended to eventually raise the pond. At the pond, gates in the flume should be spaced 20 ft. apart, and light V-shaped troughs, trestled up, carrying the pulp near the outer bank. The coarse sand naturally settles at this discharge point, while the slime flows back toward the hill-side of the pond where the wasteway is situated. The pond should be divided into two or more parts: after filling one, it is dried sufficiently to enable the bank to be raised by shoveling, while the other is being filled. As the bank is composed of



Building Up Tailing Pond.

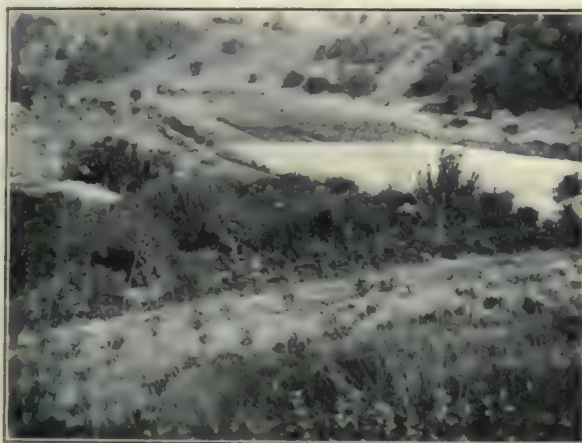
coarse sand without slime as binder, cracks are liable to occur in freezing weather, resulting in bad breaks. The wasteway for the overflow water should be a three-plank flume, 6 in. square, built on the ground, and in the middle of the hill-side of each part; the height of the overflow is raised as necessary by nailing on 6-in. widths of plank. The mill-flume can be trestled along the outer bank of the pond and the V-shaped troughs dispensed with.

Where the tailing is being banked for cyanide, a system of filling should be used that will result in the sand and slime being well mixed instead of segregated apart. Four or more sets of inlets and outlets should be spaced about each section, and a change made daily or semi-daily to a new set. This will result, to some extent, in throwing a layer of sand on top of a bed of slime, into which the sand will sink. While the mixing will be imperfectly done, it will be sufficient to enable a resourceful cyanide man to easily leach the whole dump, instead of leaving a large quantity of slimy material behind as unleachable.

Where it is desired to return some of the water, the ponds can be constructed along the line first described; but it is better to build a de-watering plant in the lower end of the mill, where it can be easily reached by the men on duty and where a pump can be belted to motive power already in place. These

plants are not expensive. Distribute the pulp to some deep pulp-thickening tanks—the number depending on the quantity of pulp and the settling rate of the slime, having an annular overflow, and introducing pulp some distance below the surface of the overflow, so as to get the settling effect of a slowly ascending current. The tanks should have cone bottoms of 60° pitch and be fitted with large gate-valve discharges, by which the sludge is partly, but not completely, withdrawn at intervals. These settlers are satisfactory, giving a thick sludge, and requiring little labor or attention. If the wooden box-settler is used, it should be divided into compartments ending in these cones with gate-valve discharges.

A novel instance of mill-tailing put to agricultural purposes is found in a California camp. Some 30 years ago, the tailing from a large mill crushing a quartz ore containing much of the slate in which the orebody lay, after running in a creek for three miles,



Farm-Land Made From Tailing.

was caught and impounded to form a soil. The flat bottom of the creek had been cleaned bare by placer miners years before. A stone wall, 6 by 15 ft. high, was roughly laid up to keep the creek on one side, and as a bank to raise the proposed surface above possible high-water. This wall was about 2200 ft. long, and gave a strip of ground of that length and from 125 to 250 ft. wide, to be filled by the tailing. This filling was done in sections and required several years. The surface was well manured, and was found to make an excellent soil for growing vegetables and fruits, being preferred to the natural soil, and it has been actively worked to this day.

With this tailing-pond garden as a nucleus, the surrounding hill-sides were brought under cultivation as hay fields and orchards, and eventually the mountains about were called upon to support numbers of cattle. In this way there was developed a valuable piece of property and a highly remunerative business. The originators of this idea were Italians. Various propositions looking to the extraction of the gold still remaining in these sands have been made, but the owners are loath to risk losing the goose that lays the golden egg for them. A smaller farm has recently been constructed in the same manner higher up the stream, a part of which has been brought under cultivation, as seen in the accompanying illustration.

ELECTRICAL MINE-PUMPS IN EUROPE.

Written for the MINING AND SCIENTIFIC PRESS
By A. S. ATKINSON.

The application of electricity to the operation of colliery pumps on the continent of Europe has attained great success in the last decade, and the results are both on the side of high efficiency and profit, but in using pumps of large capacity for mine purposes, it has been found that much depends upon the adaptation of various types to particular purposes. In this respect the engineering profession has followed certain well-defined principles which are today recognized as of prime importance in the installation of any mine machinery.

There has been a tendency to reduce the high-speed pumps for high-lifts and to substitute a moderately high-speed type owing to the greater security from break-downs, valve-troubles, and delays. In all mine-pumping safety and reliability come before efficiency. The modern electric pump, as used mostly in European collieries, is a medium between the express pumps of large capacity run at 250 to 300 rev. per minute, and the old-fashioned slow-speed pumps of 50 to 80 rev. The most successful type installed are apparently those which make from 120 to 200 rev. per min., for besides moderate speed and high efficiency, there is a great gain in safety and reliability. The small pumps, of course, are operated at higher speed, especially where they are belt-driven. Electrically driven high-pressure pumps for mining purposes are of several types, such as the Sulzer and Rateau pumps, and their many variations. At the Victor-Rauxel colliery, in Westphalia, several of the former type have been in operation for some time, and their success is worthy of note. The centrifugal pumps are of high capacity, and work against a head of 1800 ft. They are placed at the pit-bottom, and are installed two in a series. Each pump has a capacity of 1500 gal. of water per minute against a head of 900 ft. These pumps are run day and night, and during the 5 years they have been in operation, there has hardly been a hitch. The uninterrupted working of the pumps, and their high efficiency, demonstrate the satisfactory results that may be obtained from electricity as motive power for mine-pumping. The plants have shown an average total efficiency of 59%, the pumps giving 75% and the motor itself 93.

Pumps of the Rateau type have been installed and kept in good working order for a number of years in the Carmaux colliery, France, and here, too, reliability and economy of operation have been obtained. One of these pumps has a capacity of 80 gal. of water per minute, working against a vertical head of 1350 ft., at a speed of 2900 rev. per min. This type of pump is considered better adapted to the pumping of smaller quantities of water against a greater head, and the Sulzer pump is best suited for large quantities and lower heads. The chief difference between these two types of European pumps and their many variations is in the manner of forcing the water out. In the Rateau type the water enters the passages of each impeller at the centre, and is then forced to a collecting-chamber by rotation. In the Sulzer pump and its modifications the water flows on the impel-

lers in an axial direction, and is then thrown out radially. Both types are operated by high-speed three-phase motors. These are best adapted to mine-pumping and are also the cheapest and most reliable. The motor can be worked up to an output of 100 hp. without a starting switch. The 3-phase motor adapted to mine-pumping is practically free from any danger of a break-down, and if direct driving be employed there are fewer parts to get out of order. Gearing and belts always increase the danger of interruptions and break-downs. In the collieries mentioned the motors are installed between the pumps, and are direct connected. They have centrifugal compensators that are made completely gas and water-tight, and they cut out the starting-resistance automatically.

A number of electrically operated pumps have also been in use in the South African mines, and their record of continuous operation is little short of marvelous. One of these pumps installed at a depth of 1500 ft. was operated without interruption for two years, and then the mine was abandoned for a year, during which time it became flooded. When operations were re-commenced, the pump which had been left there was cleaned and repaired, and it has run continuously ever since. Much of this success, however, depends upon the type of pump, and the carefulness with which the electrical and other equipment are installed. The pump-rooms in the European mines are built of stone or brick, and they are made as near as possible water and gas-tight. This practice is followed even in mines that are considered exempt from fire-damp. The brick or stone pumping-room must, however, be well ventilated and lighted, and if it serve as a distributing station for the whole colliery, the cables entering it can always be inspected and repaired without trouble. The long life of an electrically operated pump depends a good deal upon the care given to every part, and this cannot be done unless the pumping station and room are made light and clean.

Where there is always danger of fire-damp and floating gases the necessity of making the electrical equipment gas and air-tight is quite important. The switch-gear in particular must be tight against gas. If all the switch-gear be installed in a single room where workmen are not allowed to enter, the danger of accident is greatly reduced. A central telephone station installed in the pump-room, connecting with all parts of the mine, further improves the certainty of protection from long break-downs and accidents. The telephone station thus pays for itself in a short time, and so greatly facilitates operation in a large mine that it is almost invaluable. Electrical pumping in collieries makes the most flexible system yet devised, but, of course, where the mines are flooded the difficulties must be met in other ways. This is overcome in the European mines, equipped with electrically operated pumps, by using sinking-pumps which can work under water for any length of time. Nearly all of the collieries are equipped with auxiliary pumping apparatus, so that they can cope with an unexpected flood of water due to accidents at any time. If the pump-room be made water-proof up to at least three or four feet above the bottom level, the

spare pumps can be put into operation before any material flooding and damage follow. The sinking pumps are specially installed under conditions somewhat different from the stationary pumps. They have to be adapted to each particular mine in such a way that they can operate satisfactorily under excessive and unexpected flooding at short notice. Electricity lends itself to the operation of sinking pumps much more readily than steam, for in the latter case the cooling effects of the water act as condensers and retard the operation.

In Europe, where electrically driven pumps have been in operation in mines longer than in this country, the average efficiency has been found to reach about 65%. This is based upon the following allowances of efficiency of the different parts of the plant; engines, 88; dynamos, 93; cables, 97; motors, 90, and pumps, 86%. The express-pumps have the highest efficiency, reaching in some cases a total of 95%. Express-pumps of the most improved type average between 90 and 92. The centrifugal pumps have a lower efficiency than the other types, but this is partly compensated for by a higher motor-efficiency. This difference in the efficiency of the two types is more noticeable in those of small capacity, and in the larger pumps it gradually disappears until it becomes approximately the same.

The high-pressure centrifugal mine-pumps have found great favor in most of the European mines because of their wonderful simplicity, lightness, high-speed, and compact small dimensions. These are qualities which are most desirable in deep mines where the water-head must be kept down through continuous and interrupted pumping. The great flexibility of the cables enables the mine operators to use sinking pumps at almost any part of the mine on very short notice, and this has saved more than one mine from being flooded through some slight accident. On the other hand simplicity of operation and installation does not mean that the equipment can be carelessly designed and constructed. The construction must be of the best, and adapted to local needs. There is no place in mine operation where ignorance or oversight causes greater trouble than the installation of big centrifugal pumps. With the initial installation properly made, the repair and maintenance-cost is relatively light. With fair attention to the up-keep the danger of break-downs is practically eliminated. This has been fully demonstrated in the continental collieries where electric pumps have been employed for upward of 6 or 7 years. Other mines are being equipped with pumps similarly operated, so that it may be assumed that within a year or two the leading mines in Europe will have at least one or more sets of electrically operated pumps in use. The practice in Europe, for the most part, is to use motors with the 3-phase system, with the motor turning around a vertical axle, which is carefully balanced and protected from dripping water. Ball-bearings carry the weight of the rotating parts, and these are enclosed in a hood which also protects the starting device. The motor-shaft and pump-axle are in one piece. All the windings are extra-insulated, so that the cable and wires are not seriously affected by the dampness of the mine. The starting and stopping

device is placed on the pump, so that full control can be had within the shaft. This avoids delays which might prove serious if signals had to be made to the surface. All the switches and starting devices are enclosed in protectors that are both gas and water-tight.

The installation of an electric power-station in the European mines for driving pumps generally means the application of this power in time to the operation of other machinery. It is a simple matter when the plant is installed to use the power for driving fans and operating hoists and other equipments. At several of the French collieries the hoisting is done by electricity, and recently a producer-gas plant has been installed for generating the electricity. The producer-gas is made from the slack-coal at the colliery. Before the producer-gas plant was installed the waste heat from the coke-ovens was utilized for power. The producer-gas plant, however, has developed a distinct gain over the old method of using the waste gases. This work of equipping collieries with producer-gas plants for generating electricity, and then distributing the power as needed throughout the mines, is considered by most of the leading European mining engineers as the ideal method for the future. The slack-coal burnt in the producer-gas plant represents the cheapest fuel obtainable, and the high efficiency of producer-gas plants makes the economy unusually large. One deep mine in Germany has a plant of 1000 hp. which operates dynamos sufficient to supply the mine with all the power required for hoisting, driving fans and electric-pumps. In addition to this there is an auxiliary plant which furnishes lighting for the mine and the works above ground.

The depth of this mine is 590 ft., and the net load brought to the surface at one time averages 7400 lb. Formerly it took about 6.9 lb. of coal per actual horse-power expended in raising the coal to the surface. Since the producer-gas plant has been in operation, the average amount expended for each actual horse-power used is less than 2 lb. The cost of maintenance of the producer and the electrical equipment is also small, but the initial expense of installing was naturally considerable. It is estimated that within 5 years the saving will far more than compensate for the extra expense of the initial equipment. In this mine the current is taken to the winding-engine house at 5000 volts, 3-phase, and then transformed down to 200 volts and used in the motor. The pumps and ventilating fans receive their current over a separate cable, which is flexible enough to permit of wide variation in operation. The use of the producer-gas in coal mines is not exactly a novelty, but the performance is still in its first stages, and data concerning the actual cost of operation are not generally supplied. The installation in European mines is now progressing rapidly, and their usefulness and efficiency have been widely demonstrated.

On the advancing edge of the zone of combustion in a heap of pyrites exists a stratum of fused sulphur. It appears that to a certain extent dissociation of the base and the sulphur occurs before the sulphur is oxidized.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

INJURY TO MINER—INCOMPETENT SERVANT.

The owner of a mine was held liable for injuries to a miner from the negligence of another employee acting as hoisting engineer, where such engineer was incompetent and was hired as a fireman and was required to leave that work and act as engineer as occasion required during the night-shift when no regular engineer was present.

Layzell v. J. H. Somers Coal Co., (Mich.) 120 North-west. 996, Apr. '09.

LEASE OF MINES—CONSTRUCTION.

A written instrument granting the right to mine and remove the coal in a tract of land for a period of years, and to take the necessary, usual, or convenient means for working and taking away such coal created an estate for years in the land. And if the estate created was for more than five years it could only be assigned by deed or will. In any event the assignee of the lessee was liable to the lessor for the rent reserved in the lease if he covenanted or agreed to pay the same, or if privity of estate between him and the lessor be established, but not otherwise.

Comley v. Ford, (W. Va.) 64 Southeast. 447, March '09.

INJUNCTION TO PREVENT TAKING AND SELLING ORE.

Where it appeared from the decisions in prior litigation that a mining company would, in a pending action, probably recover a large judgment against another mining corporation for the value of ore extracted from mines owned by the complainant, a court was authorized to grant an injunction restraining the defendant company from extracting or selling any more ore from the mine, and where it was shown also that the defendant mining company would not have sufficient mining property remaining to satisfy the judgments that might be rendered.

Montana M. Co. v. St. Louis M. & M. Co. 186 Fed. 514, March '09.

DRILLING OIL WELLS—EXPERT EVIDENCE.

The art or mechanical skill of properly drilling oil wells through different strata, the character of the strata, the proper treatment of them, the appropriate tools best suited for them, the proper casings, cleaning the well, fishing for and extrication of broken casing and lost tools, and other incidents in the work are not within the knowledge of people generally, and all such matters come clearly within the rules of expert evidence.

Redd v. Carnahan, (W. Va.) 64 Southeast. 138, March '09.

INJURY TO MINER—LIABILITY FOR FAILURE TO KEEP MATERIAL.

Under a statute providing that the superintendent of a mine shall at all times keep on hand at the mine materials necessary to preserve the health and safety of the employees as ordered by the mine foreman, it was decided in an action for damages for injury to a miner that, unless it appeared that the mine foreman had made a proper requisition for the materials, and it had been refused, or that the owner or superintendent of the mine had failed to keep on hand the necessary materials, or supplies, the owner of the mine was not liable. To make the mine-owner liable for injuries caused by an explosion of gas, on the ground of negligence in failing to furnish proper material, it must be shown that such negligence was the cause of the injury.

Bisko v. Brasnel Coal Co., (Pa.) 72 Atlant. 504, Jan. '09.

OIL AND GAS LEASE—CONSTRUCTION.

A lease of land to explore for oil and gas, and if found, to produce them, was held to be merely the grant of a privilege to enter and prospect, and did not convey title to any oil or gas until found.

Gillespie v. Fulton Oil & Gas Co., (Ill.) 88 Northeast. 192, Apr. '09.

American Mining Congress.

The American Mining Congress will hold its twelfth annual session at Goldfield, Nevada, September 27 to October 2, 1909. A program is being arranged which will include a discussion of various matters pertaining to the welfare and progress of the mining industry, the aim being to give greater opportunity for practical discussion and consume less time in the reading of technical papers.

During the past year the Congress has had several committees at work conducting investigations, report of which will be made to this session. These reports will be open for discussion, and the committees reporting are as follows:

Committee on Vertical Side-Line Law. By George W. Riter, Salt Lake City, Utah, chairman.

Committee on Coal Tax Insurance Fund. By Samuel A. Taylor, Pittsburg, Pennsylvania, chairman.

Committee on General Revision of Mining Laws. By Walter R. Ingalls, New York City, chairman.

Committee on Standardization of Electrical Equipment. By Edward B. Rosa, Washington, D. C., chairman.

Committee on Prevention of Mine Accidents. By H. Foster Bain, San Francisco, California, chairman.

Committee on National Forest Service. By A. G. Brownlee, Denver, Colorado, chairman.

Committee on Alaskan Mining Laws. By J. L. Steele, Landlock, Alaska, chairman.

The silver question will be discussed with a view to devising means of bringing about a greater use of silver, and decreasing the rate of exchange between the United States and countries using a silver standard. Moreton Frewen, of London, England, James J. Hill, and John Hays Hammond have been invited to speak on this subject. Goldfield citizens are making elaborate arrangements for showing the district to the delegates, and the State of Nevada has appropriated \$5000 to pay the expenses of collecting and classifying a comprehensive display of the State's minerals, which is being installed at Goldfield. The Congress will consist of the regular members of the organization, and all duly appointed delegates, who have equal powers in all the deliberations of the open body. Mining men contemplating attendance should address the secretary, Walter A. Koch, at Denver, Colorado, for more complete information.

REPORTS recently issued by the U. S. Geological Survey include a preliminary paper on the Innoko district by A. G. Maddren gives the total gold production of the district for 1907 and 1908 at \$85,200, of which the season of 1908 is credited with \$72,100. Four claims have produced more than \$10,000 each in a single season. A report on the chromite industry in the United States by E. C. Harder has also been issued. Almost the entire production comes from Shasta and San Luis Obispo counties, California. The total production of coal in Alabama in 1908, as reported to E. W. Parker, was 11,604,593 short tons, having a spot value of \$14,647,891. The decrease in production over 1907 was 2,645,861 tons. The report of J. S. Diller on the production of asbestos in 1908 states that the United States leads all other countries of the world in the conversion of raw asbestos into manufactured products, although a very small percentage of the material used, less than 1%, is mined here. By far the larger part of it comes from Canada. It is gratifying, however, to note that the production of asbestos is on the increase in the United States and that the increases are in grades that are better than those previously produced. Other reports just issued by the Survey include one on 'Gypsum and Gypsum Products in 1908', by Ernest F. Burchard, and another on the 'Production of Talc and Soapstone in 1908', by J. S. Diller.

BUILDING of small tramway lines has been a feature of the development of the State of Sao Paulo in Brazil for many years, and such roads are still being constructed in many directions. The latest project of this kind is for a road 11 miles long near Sao Paulo, for which equipment is desired. The estimated cost is \$170,000. The projector of the line is Francisco H. de Mello, of Sao Paulo.

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TABLE OF CONTENTS.

| | |
|---|-------|
| EDITORIAL: | Page. |
| Notes | 337 |
| Closing of the Argo Smelter..... | 337 |
| The Pole and the Flag..... | 338 |
| GENERAL MINING NEWS..... | 340 |
| SPECIAL CORRESPONDENCE | 345 |
| CONCENTRATES | 352 |
| DISCUSSION: | |
| Aliens' Rights in Mining Claims....H. B. Kaeding | 353 |
| Locating Placer Claims.....A. H. Ricketts | 353 |
| Assessment Work on Placer Claims...Paul J. Case | 354 |
| Mine Surveying Hints.....T. Lane Carter | 354 |
| Rejection of the Yard Mining Claims.Wm. E. Colby | 355 |
| ARTICLES: | |
| The Southern Arizona Copper Fields..... | |
|O. F. Tolman, Jr. | 356 |
| Dredging at Breckenridge, Colorado..... | |
|A. H. Bradford and Roy P. Curtis | 361 |
| Treatment of Sulphide Ores in Victoria..... | |
|S. Radcliff and J. Drevermann | 367 |
| Scaling and Sweating of Copper-Battery Plates.... | |
|Sydney F. Goddard | 368 |
| Free Settlement Method of Separating Slime..... | |
|Horace G. Nichols | 369 |
| Standardizing Electrical Mine-Equipment..... | 370 |
| Coalite | 370 |
| DEPARTMENTS: | |
| Personal | 339 |
| Market Reports | 339 |
| Catalogues Received | 370 |
| Commercial Paragraphs | 370 |

EDITORIAL.

RAILROAD transportation in Pullman cars is now open all the way from New York to Salina Cruz, the terminus of the Tehuantepec line on the western coast of Mexico. Thus travel to Central American points is greatly facilitated.

THE gross aggregate international trade of the world amounts to 30 billions of dollars annually. The United States contributed 14.4 per cent of the total foreign imports, and of the exports from other countries the United States takes 9.2 per cent.

OFFICIAL announcement by the War Department shows that a little more than 45 per cent of the total cube of excavation on the Panama Canal has been removed. The exact figures are 78,905,501 cubic yards taken out, and 95,761,094 remaining.

PIG-IRON is now being produced by the electric furnace at Heroult, Shasta county, California, and is being sold at the foundries in Redding in competition with Eastern iron, the present price at that point being \$25 per ton. It will soon invade the San Francisco market, and tend to give more stability to prices, the cost of casting iron at this point varying according to the ballast-requirements of vessels from the Atlantic cities or from China. The success of electric iron smelting will profoundly benefit industrial conditions on the Pacific Coast.

QUESTIONS of the rights of aliens in mineral lands are constantly arising. The tendency of most Governments is liberal in this matter, and the laws of the United States cannot be considered otherwise. Nevertheless the view of Congress has been that minerals on public lands constitute a resource held in trust for the benefit of citizens. Consequently an alien, whether he be an original locator, or whether he may have acquired ownership by purchase, is not accorded the right to obtain patent to a mining claim, and it is possible for the Government to institute proceedings to dispossess an alien locator. Except in the Territories, however, aliens may purchase and securely hold patented claims.

Closing of the Argo Smelter.

Announcement has been made that the Argo smelter of the Boston & Colorado Smelting Company will be closed next month, and that the company will liquidate. This will be noted with regret by technical men familiar with the history of smelting in the West. The plant was first built at Black Hawk in Gilpin county, Colorado, in 1867, but in 1878 it was removed

to Argo, near Denver. It was founded by Richard Pearce and Nathaniel P. Hill, and the company has always been noted no less for the high plane upon which its business was conducted than for the excellence of the technical performance of the plant. It was the first smelter which successfully treated the pyritic ores of Colorado, using copper for a base. In the early days it drew from Montana, the Black Hills, Colorado, New Mexico, and even from Arizona and Utah. The field has gradually narrowed as newer plants have been erected, and aggressive competitors have come to the fore. In the meantime the character of the ore shipped from Gilpin and Clear Creek counties has materially changed. Whereas formerly ore containing 15 per cent of copper was readily available, that now shipped direct to the furnaces is silicious, and seldom contains more than 3 to 4 per cent of that metal. Concentrates from these counties carry about 2 per cent of copper. Ores from the Black Hills are no longer largely smelted, and Utah and Arizona have their own plants. The Argo, it is announced, can no longer make a profit with the present plant under existing conditions. It is comforting to know that profits in the past have been large, and that the company closes a long and honorable career without having drifted into financial straits. Shortage of ore of suitable character is solely responsible. It is not a case of being driven out by a trust. While the Boston & Colorado Company has maintained its independence, it has worked cordially with the American Smelting & Refining Company since the latter was organized. The Chamberlin Dillingham Ore Sampling Company has bought ore for both companies under an arrangement whereby all ore of certain grades and character went to the Argo plant, while other ores were turned over to the larger company.

The passing of the Argo smelter marks an epoch in the history of smelting in the West. In its career it made possible the opening of many mines. The mining districts that its facilities made productive have developed smelting plants nearer home, and in the resulting competition of region against region Colorado is undoubtedly losing ground. While old plants are running and new ones are being built, the aggregate amount of ore being smelted in the State is declining. Modern mines, based on large tonnage of low-grade ore, necessitate smelting at the nearest centre at which flux, fuel, and water are available, and Montana, Utah, and Arizona have the lead.

The Pole and the Flag.

America has the honor of the greatest achievement of recent times in the field of exploration. "Stars and Stripes nailed to the pole"; such was the laconic message of the twentieth-century Harald Hardrade, who may be called in a modern sense the 'King of the Northmen'. Commander Robert E. Peary has won the pole in the way that all great things are done; by knowledge and persistence. Taught by experience, patiently exhausting years in strenuous effort, surveying ice-locked coasts on the frozen edge of the world—the Ginnungap beyond which lay the goal shrouded in mystery for centuries—Peary laid

his foundations well; he followed the 'good old maxim, "get ready first"; and he won. He has been twenty-three years doing it, and the world doubted that it would be done. But one brave woman never doubted, the woman who shared the arctic rigors with him in her earlier years, and spurred him on with faith and trust. It is beautiful to see the words which reveal the source of inspiration leading to triumph, in the message from Indian Harbor to "Jo" (Josephine Diebitsch Peary), "Have made good at last." We remember the youthful ardor of Commander Peary when he was but 34 years of age; he must hasten with his work, because men from the South could not stand the severity of the Arctic after 40; but he has had to struggle on far beyond the limit set in his youthful fervor, and he is 53 when he plants the flag on the pole. We give our praise to Peary, without discrediting the achievement of Dr. Frederick A. Cook. The world will suspend judgment, regretful to see the brilliancy of this exploit, so satisfying to national pride, clouded by a personal controversy. It would have been pleasanter if Peary had merely laughed and waited for further light. It evokes the funny man, who cannot help remarking on the high temperature generated by friction over the pole. Jules Verne in story placed a volcano on the axial point of the earth; and there has come in very truth an eruption of human wrath. It makes but little difference whether Dr. Cook reached the spot first or not. A dash, made with the advantages so largely provided by Commander Peary cannot detract from the merit of the man who pushed his way relentlessly against obstacles, following a plan that could not fail if persisted in. Dr. Cook is well known as an intrepid explorer. He received his first training under Peary in 1891-92. Subsequently he served a Belgian arctic expedition as surgeon; and later he fought his way to the top of Mt. McKinley in Alaska, which places him among the ranks of the most daring Alpinists. For these achievements he has been decorated with medals and other marks of distinction. He is no petty weakling, incapable of the deed he claims to have accomplished. But we cannot fail to note the characteristic of the man acting in the spirit of sport rather than in that of science. He gives no details; his observations seem to have been no more than sufficient to hold his course as a mariner might at sea; Peary, on the contrary, has given out data which present a picture to the mind even before he has flashed the great message that is promised. We see the drift of the ice, the opening and closing of 'leads' or channels, and patches of open sea; an itinerary is given; and we know that details of value to geography are coming.

The practical results, however, are few. Even if an observatory were planted upon the pole no more accurate astronomical observations would follow than are now possible from the multiplicity of stations all over the earth; moreover, the pole itself is not a fixed point; it migrates, as geophysicists long ago determined. Nevertheless, if the area of polar variation had been on land there is no telling but national pride would have resulted in ultimately establishing a tip-end observatory with the eagle

screaming from the dome. It is as easy to arouse a people to the doing of a fanciful thing as to expend money in providing the demonstrably economic. We venture to say that the interest of every man, woman, and child is keener over the discovery of the north pole, than it will be over the opening of the Panama Canal to traffic. The mind wearies of prose and account books; it needs some poetry, and extravagant chasing of Robin Goodfellow; it must also have some spectacle of spendthrift heroism now and again to

of the romance which has thrilled the world. Then came the determined search for the lost explorer, which yielded information of such value as to advance the knowledge of the Arctic regions so rapidly as to pave the way for the further successes of Kane, Hall, Nares, and that growing list of adventurers that has ended with Peary's conquest. It is interesting to note that the work of Nansen and Peary had already raised a presumption that the polar area was covered by water. The evident line of drift of



Map of the North Polar Region.

remind us that to be too terribly sane is to dull one's soul. The moral effect is the great gain from the splendid victory over the ice-guard around the pole. The map tells part of the tale of heroism displayed by the brave men who tried and failed. The story goes back, in fact, so far into the past that we read of the marvelous voyage of Pytheas in Grecian history. He certainly penetrated the land of the winter night. Modern quest for a recognized geographical spot began with Sir John Franklin. The story of the expedition of the *Erebus* and *Terror* has formed part

the *Jeanette* and of the Mellville-Bryant cask, had also rendered it nearly certain. The conditions to be met were well understood in advance, and success was the logical outcome. At last the quest of the pole is over; Mr. Walter Wellman, after taking good care for several years not to get actually started from Spitzbergen in his airship, is relieved from further embarrassment; and the world will now have to set up some other popular mystery to worship until the man with pluck and daring comes to scale the wall that hems it in.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. E. GORDON FIREBRACE is in Peru.

JOHN B. FARISH was in San Francisco.

J. D. IRVING is at Palo Alto, California.

CARNEY HARTLEY is in Routt county, Colorado.

JAMES W. NEILL passed through San Francisco.

WALTER W. DAVIS, of Leadville is at New York.

R. D. GEORGE has been at Kellogg, Iuaho, this summer.

A. H. LAWRY has left Goldfield, and is in San Francisco.

W. R. CHADBOURNE, of San Francisco, is visiting Leadville.

J. F. KEMP has been spending the summer in the Coeur d'Alene.

Audley H. Ackerman is in London on a brief holiday from Rhodesia.

H. B. TAYLOR has gone to Hinsdale, Colorado, on professional business.

C. W. CADDAGAN has returned to Los Angeles after a year's sojourn in Brazil.

P. H. ARGALL has been transferred from the Selby smelter to Pueblo, Colorado.

F. F. SHARPLESS has left New York for a trip through Colorado and Arizona.

J. W. FINCH has returned to Denver from Butte, Montana, and the Coeur d'Alene.

ROBERT SCHORR has gone to New York. He will be in San Francisco by October 1.

LEO VON ROSENBERG, of New York, was in Seattle and has gone to Butte, Montana.

S. F. EMMONS has been at Breckenridge, Colorado, and has gone to Ely, Nevada.

F. L. BOSQUI sailed from New York for London on the S. S. *Celtic* on August 28.

FRANK C. LORING has fully recovered from his illness and is now back at professional work.

HERBERT HAAS has postponed his journey to South America, and is now at New York.

W. H. SHOCKLEY has gone to Sobolinaya, Siberia, to examine the Kluchi mines for Hooper & Speak, of London.

CLIFTON H. KROLL, of Atkins, Kroll & Co., left on August 30 for Europe. He will visit England, France, and Germany.

CHARLES J. MOORE has returned to Colorado from Goldfield and will hereafter divide his time between Denver and Leadville.

FRANK L. SIZER has been appointed superintendent for the Balaklala Consolidated Copper Co., succeeding R. N. Bishop, resigned.

GEORGE R. FIELD, contracting engineer for the Risdon Iron Works, has resigned. He becomes assistant general manager for the Great Western Power Company.

R. N. BISHOP has resigned from the managership of the Balaklala mine, Coram, California. He will open an office at 1121 First National Bank Bdg., San Francisco.

An apparently unimportant suit brought in the district court at Butte by lessees of the Ticon mining claim, owned by James A. Murray, against the Anaconda Copper Mining Co. for something less than \$1000, and to determine the ownership of an orebody on the 500-ft. level of the Ticon mine, appears to be the entering wedge of the long threatened litigation between Mr. Murray and the North Butte and Anaconda companies over what is supposed to be the western portion of the rich Edith May vein. Murray's contention is that the vein does not have its apex in the Edith May mining claim, but that it belongs partly to the Ticon, which is situated between the Edith May and the Speculator claim, on which latter is situated the North Butte working shaft. About 60% of the original location of the Specu-

lator, the western portion, is owned by the Anaconda company, and the latter's portion adjoins and lies south of the Ticon. In the mining operations by the Ticon lessees they followed their vein and orebody, beyond the sidelines and mined under the surface of the Anaconda Speculator. The Anaconda company threatened injunction proceedings and tied up the smelter returns on the ore shipped. Murray then sank a new shaft on the Ticon, following the vein on its dip and traced the ore connection, his engineers claim, from the surface to the point where the ore was mined on the 500-ft. level, and suit was brought against the Anaconda company to settle the title and right to the money for the ore taken out. Unless the controversy is settled out of court, and Murray should be successful in the suit just brought, enormous litigation is likely to follow. The ore mined from the disputed territory by the Anaconda and North Butte amounts to many millions of dollars.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, September 8.

| | | | |
|--------------------------|------------|--------------------------|-------------|
| Antimony | 12-12½c | Quicksilver (flask)..... | 43.50-44.50 |
| Electrolytic Copper..... | 15¼-16½c | Spelter | 6½-7¼c |
| Pig Lead | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound

| Date. | Electrolytic Copper. | Lead. | Spelter. |
|--------------|-------------------------|-------|----------|
| Sept. 8..... | 13.00 | 4.22 | 5.73 |
| " 4..... | 12.93 | 4.22 | 5.73 |
| " 5..... | Sunday. No market. | | |
| " 6..... | Holiday. No market. | | |
| " 7..... | 12.93 | 4.21 | 5.72 |
| " 8..... | 12.93 | 4.21 | 5.72 |
| " 9..... | 12.93 | 4.21 | 5.72 |

ANGLO-AMERICAN SHARES

Cabled from London.

| | Sept. 2. | Sept. 9. |
|------------------------|----------|----------|
| £ s. d. | £ s. d. | £ s. d. |
| Camp Bird..... | 1 7 6 | 1 8 6 |
| El Oro | 1 6 0 | 1 5 6 |
| Esperanza..... | 3 0 0 | 3 0 0 |
| Dolores..... | 1 10 0 | 1 10 0 |
| Oroville Dredging..... | 0 12 6 | 0 12 6 |
| Mexico Mines..... | 6 6 3 | 6 11 3 |
| Tomboy..... | 1 1 3 | 1 1 3 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

September 8.

Closing Prices.

September 8.

| | | | |
|-------------------------|-----|---------------------------|-----|
| Adventure..... | 6¾ | Mohawk | 62 |
| Allouez..... | 52 | North Butte..... | 59 |
| Atlantic..... | 11 | Old Dominion..... | 55 |
| Calumet & Arizona..... | 105 | Osceola..... | 145 |
| Calumet & Hecla..... | 680 | Parrot..... | 32½ |
| Centennial..... | 41½ | Santa Fe..... | 2½ |
| Copper Range..... | 81½ | Shannon..... | 15¾ |
| Daly-West..... | 8½ | Superior & Pittsburg..... | 15¾ |
| Franklin..... | 16¼ | Tamarack..... | 70 |
| Granby..... | 99 | Trinity..... | 12¼ |
| Greene-Canaan, etc..... | 9¾ | Utah Con..... | 44¾ |
| Isle Royale..... | 24 | Victoria..... | 31¼ |
| La Salle..... | 15 | Winona..... | 5¾ |
| Mass..... | 8½ | Wolverine..... | 157 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 8.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 15 | Midway..... | \$ 20 |
| Belmont..... | 82 | Montana Tonopah..... | 90 |
| Booth..... | 13 | Nevada Hills..... | 70 |
| Columbia Mtn..... | 10 | Ophir (Comstock)..... | 1.30 |
| Combination Fraction..... | 81 | Pittsburg Silver Peak..... | 65 |
| Daisy..... | 16 | Rawhide Coalition..... | 27 |
| Florence..... | 3.00 | Rawhide Queen..... | 25 |
| Goldfield Con..... | 6.50 | Round Mountain..... | 70 |
| Gold Keweenaw..... | 9 | Sandstorm..... | 9 |
| Great Bend..... | 7 | Silver Pick..... | 14 |
| Jim Butler..... | 14 | St. Ives..... | 10 |
| Jumbo Extension..... | 17 | Tonopah Extension..... | 69 |
| McC Namara..... | 32 | Tonopah of Nevada..... | 7.00 |
| Mayflower..... | 14 | West End..... | 31 |

Dividends.

On Saturday, September 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 144 of \$45,000. This makes the amount of dividends paid since January 1, 1909, \$480,000, and the total to date \$11,151,000.

General Mining News.

ALASKA.

(Special Correspondence).—The Kuskokwim river has been considerably explored and prospected this season; it is estimated there are 75 miners on the stream and its tributaries. The Tuluksak, which flows into the main stream 300 miles above the mouth of the latter, has been the scene of limited placer mining. On the upper course of this Tuluksak and on Bear creek, that flows into it, seven men have made some valuable discoveries. Banlard & Kizer will clean up several thousand dollars. Fisher and Grant a like amount. They find bedrock at a depth of 2 to 8 ft. Some placer claims have been staked there. C. D. Scott, of Nome, spent a month this summer on the Tuluksak, and reports no available supplies in that region. Bethel, a Moravian mission and trading post, is 150 miles up-stream from the mouth of the Kuskokwim. A common route to the Kuskokwim is from the Russian mission on the Yukon, 80 miles easterly along a chain of lakes, with short portages between lakes. The mail route from Russian mission to Bethel is by way of these lakes and portages.—Reports from Porcupine, 38 miles from Haines, are that 270 oz. of gold were recovered as the result of a 20 hours run recently at the placer workings of the Porcupine Gold Mining Co., where E. E. Harvey is in charge.

Nome, August 10.

ARIZONA.

COCHISE COUNTY.

A body of copper ore assaying from 7 to 10% copper was opened by the cross-cut from the 1500-ft. level of the Junction shaft of the Superior & Pittsburg company. This discovery was made while working toward the Briggs shaft and is so encouraging that the company is planning to reopen that shaft about the first of the year. The company is doing considerable development work at the Cole shaft driving north and south on the tenth and eleventh levels and cross-cutting in both directions.—At the Irish Mag shaft of the Calumet & Arizona an orebody has been cross-cut on the 650-ft. level that runs from 15 to 17% copper.—At the Czar shaft of the Copper Queen the water conditions are much improved. The steam pumps that were running to keep the water from the summer rains down have been stopped and the electric pumps are handling the water easily. The copper output for August will be larger than that of July and will be approximately equal to May and June production. The Sacramento shaft is down 1600 ft., and a station is being cut at that point. A cross-cut will be run from here to the Lowell shaft.—On the 500-ft. level of the Shattuck the drift opened a body of cuprite that assays from 30 to 35% copper.—W. V. Richards, of Bisbee, has bonded the Leadville group in the Paradise district from George A. Walker. Operations are to be started by the first of December and hoisting machinery and pumps to unwater the mine installed. The property is one of the oldest in the district and has had a varied history. Located in 1879 a small amount of ore was shipped to the old Galeyville smelter, one mile below Paradise, but the mine did not become a paying proposition and was abandoned. The claims were re-located in 1889 and in 1890 and 1891, 29 cars of ore were shipped to the El Paso smelter from the 100 and 140-ft. level.—The cross-cut from the 120-ft. level of the Doran & Gallagher property intersected a vein of lead-silver ore with a small amount of copper. Larrieu & Cross are operating the mine under a bond.—H. D. C. Buford shipped a small lot of ore to the El Paso smelter that ran 20% lead.—The owners of the Savage property have stopped work and closed down the mine.

GILA COUNTY.

The Arizona Commercial Copper Co. has a large force of men at work on the sixth level blocking out the ore preparatory to the blowing in of its smelter. A drift has been run 650 ft. on the ore at this level. In the new smelter the blast-furnace is to be constructed to handle 500 tons per day at present but will be increased to 1000 tons at some

later date.—A 3-drill compressor is being installed by the Superior & Globe company and sinking will be continued with machine drills. The shaft is now down 475 ft. The company will cut a station at the 500-ft. point and cross-cut to the vein. The shaft will be continued to the 700-ft. level and lateral work started there before any stopes are opened.—The cross-cut on the 900-ft. level of the Arizona-Colorado has been driven 175 ft. toward the vein. S. C. Phillips is superintendent.

MARICOPA COUNTY.

L. F. Reynolds, of Morristown, has bonded the old Garcia claims in the Wickenburg district, and organized the Santa Fé Gold Mining Co. to operate them. A 300-ft. shaft has been sunk on a 2-in. vein that assays \$45 per ton. The two upper levels have been worked out and it is estimated that \$700,000 was taken out.

MOHAVE COUNTY.

A force of men has been started to work at the Gold Bar group near Cerbat. The property is situated on the gold belt that crosses that country and formerly produced considerable rich ore.—It is understood that the final payment is to be made on the Gold Cross property and work resumed at the mine.—At the St. Louis mine Dooley & Collins are driving a cross-cut on their lease to open an 18-in. vein of lead ore. A small amount of gold and silver is associated with the lead.—A heavy flow of water has been struck in the shaft of the Golconda mine at a depth of 360 ft. It is the intention of the company to cut a station at the 385-ft. level and commence stoping at that point.—The adit at the property of the Expansion Gold Mines Co., at Union Pass, opened a vein of free-milling ore. The company is erecting an experimental mill on the property. Charles J. Hutchison is superintendent.—A Chicago firm has secured a bond on the Portland group in the Music Mountain district and is cleaning out the old shaft preparatory to sinking.—A car of copper ore was shipped by T. S. O'Brien from the Bunker Hill at Cerbat.—The shaft of the Gold Bug mine is down 450 ft. At the 400-ft. level the ore was opened while cutting the station and found to be dipping from the shaft at a slight angle. When the 500-ft. level is reached a cross-cut will be run to the vein and drifts driven in both directions. O. B. Amsden is manager.—The Mammoth Silver Mining Co. made the initial payment of \$10,000 for the purchase of the Hackberry mine. The company has sunk a shaft on the property and opened a good vein of milling ore. The company also has an option on the claims of W. K. Ridenour and W. L. Kayser in the Wright Creek district.—E. L. Godbe, of Salt Lake, has purchased the interest of W. D. McCright in the McCracken mines and has secured an option on the balance of the old McCracken and Signal mines. A shaft on the property has opened a vein of lead-silver-gold ore to a depth of 400 ft.—A contract has been let to sink the shaft at the Horseshoe mine 300 ft. This will give a total depth of 500 feet.

YAVAPAI COUNTY.

A shoot of ore assaying 280 oz. silver has been opened on the property of the Zero Mines Co., 10 miles south of Prescott, an adit will be started to cut the vein at a deeper level.

YUMA COUNTY.

The management of the Clara Consolidated Gold & Copper Co. has decided to increase the capacity of its smelting plant from 450 to 700 tons per day on account of the large increase in ore reserves opened by recent development work. This addition will be completed by the time the Arizona & Swansea railroad is finished.

CALIFORNIA.

ELDORADO COUNTY.

The Alaufeseyte Products Co. has purchased the Vandalia mine and a number of other properties in that neighborhood and are preparing to open them in the near future.—Work is to be resumed at the Eagle King mine at Grizzly Flats this fall.

NEVADA COUNTY.

(Special Correspondence).—The electric pump recently

installed at the 2200-ft. level in the Empire is working satisfactorily. Another of the same type is about to be placed on the 3400-ft. level. On the 1100 a Lakenan pump is in operation. Sinking will be commenced within a few weeks. Forty stamps are dropping, and it is understood about \$60,000 is being turned out per month.—In the Deadman's Flat district considerable prospecting is going forward. Recent developments in the mines there have not been particularly satisfactory.—At the Sultana good ore is coming from the 600-ft. level and the mill is running steadily. Ore is being opened in the lower workings.—The Posey Canyon company has levied an assessment in order to carry on developments.—It is reported that H. G. A. Brunner, manager of the Conlan M. Co., will be here in a few days, and that arrangements will be perfected for the resumption of activities.—The pumps at the Pittsburg have lowered the water to the 80-ft. level, and machine drills are running on the 600 and 700. The new electric plant has been practically completed.—The Murchie mine is being examined by Los Angeles engineers, and it is probable that steps toward the opening of the property will be undertaken shortly.—A rich shoot of ore, believed to be the McMurray vein, has been cut beneath the McMurray shaft in the Delhi. Considerable bonanza ore is being extracted.—Twenty stamps are dropping steadily at the Champion. Most of the ore is coming from leases.—At the Mountaineer the new shaft is making good progress. Considerable ore is being taken from the old workings.—It is reported that the development will be more active in the Cold Springs.—More men are working at present in the Grass Valley-Nevada City district than for many years, and the 8-hour system has been productive of good results.

Grass Valley, September 6.

George A. Shelby has sold the controlling interest in the Golden State mine on Bear river to J. T. Hennessy, Thomas Gill, and associates of Grass Valley. The property contains 80 acres of good timber land, an excellent water right, and is equipped with a 5-stamp mill. An upper adit opened a rich shoot of ore which was run through the mill with good results and a lower adit has been started that will give 400 ft. of backs.—Albert R. Herman, the president of the Rudolph-Herman Co., is authority for the statement that the company will commence development work at its property near Spenceville at once. A number of specimens of copper ore have been taken from the claims.—The raise from the adit level to the surface of the Fairview mine has been completed. It was driven a distance of nearly 500 ft., and was in pay-ore the entire way. Drifts are being run in both directions on the ore and a large tonnage will be blocked out by the time the mill is completed. The plant is situated 800 ft. below the present level and a lower adit will be driven at some future date to open the vein at this point.—The Erie mine, near Graniteville, has been purchased by a group of Wheeling capitalists from George Mainhart, and operations will be resumed at the mine some time this month. R. G. Eckis will manage the affairs of the company.—The 5-stamp mill at the El Oro mine in the Graniteville district was destroyed by fire. The mill was a comparatively new one having been built about a year ago.—Bray Wilkins has resigned from the position of manager for the Idaho-Maryland Development Co., and Robert Nye, of Grass Valley, has been appointed as his successor.—A vein of good ore has been opened by the adit at the Gold Canyon mine on the middle fork of the Yuba river.—A 12,000-lb. boiler is being hauled to the Birtchville mine near Graniteville.—The United States Mining & Smelting Co. has purchased the Iron Mountain mine at Indian Springs from M. C. Taylor. Considerable iron ore was shipped from the mine when it was first opened by Mr. Taylor, but the ore changed to a copper sulphide with depth and the work was stopped. About five years ago Henry C. Schroeder secured a bond on the property and blocked out a large amount of ore. Since that time he has been trying to interest some large company and has at last succeeded in making the sale to the United States company.—Ground has been broken for the new 3-compartment shaft at the Brunswick mine. It is estimated that the shaft will intersect the vein at a depth of

1250 ft., and no cross-cutting will be done till that point is reached.

PLACER COUNTY.

The Denver syndicate, operating the Dewey mine under bond, is to prospect the vein on the Dodd's ranch. A small shaft has been sunk on the property and some good ore taken out.—F. A. Moss has run a 100-ft. adit, sunk a shaft, and cross-cut the James vein.

SHASTA COUNTY.

The dredge of the United States Gold Dredging Co., on Middle creek, broke in half owing to a large amount of machinery placed in the boat. The cost of the dredge was \$75,000 and it had just been overhauled and fitted with new machinery at an expense of \$15,000. The stern struck on a rock and is still above water but the bow is 15 ft. below the surface.—The storage bins at the terminal of the aerial tram at the Mammoth smelter, will have a capacity of 20,000 tons, and will be completed some time this month. A large portion of the structural steel for the addition to the smelter has arrived and an extra force of men put to work on the building.—A 75-hp. electric hoist has been ordered by the Mountain Copper Co. for the Iron Mountain mine.—A heavy flow of water was struck by the diamond-drill in the Summit mine.—The committee appointed to interview the managers of the smelters reported to the Association that they had seen R. T. White of the Balaklava Copper Co. and A. S. Haskell of the Mammoth Copper Co., and that neither of those gentlemen had the authority to promise anything in behalf of the companies, but would consult with the other officials to see what could be done and asked that any action be postponed till the first of October. The Association will undoubtedly delay any further work till the smelter managers give them an answer. The committee visited the Bully Hill smelter, at Winthrop, though no claim is made that it is doing the farmers any damage.

SIERRA COUNTY.

The ore-shoot at the Oakland mine has widened till it is now 18 inches.—W. R. Warton, of Los Angeles, is to take over the Cleveland mine near Sierra City. A small force is to be kept at work this winter and more extensive development done in the spring.—The company holding a bond on the Nugget Nell property has started drilling to determine its value.—George W. Scott and associates, of Sacramento, have purchased the Fischer hydraulic mine near Sierra City and are making arrangements to work the property this winter. There is an excellent site for a restraining dam below the mine and the California Debris Commission will be asked for a permit to build a restraining wall to impound the tailing. A ditch is being dug that will bring the water to the mine under a high pressure.—Francis B. Voyle has dropped his suit against the Sierra Mining Co., operating the Alaska mine near Pike City, giving as his reason for this action that the company is heavily bonded and would not be able to settle if his suit was successful.—Considerable activity is manifested in the old mining camp at Brandy City. About 100 men are working in the neighboring mines and application has been made to have the postoffice re-established.—The Hewitt Brothers have sold their property on Hopkins creek to C. B. Wingate who is representing a syndicate of Scotch capitalists.—The Nissen mill at the Red Star mine has been completed and is running on good ore.—W. F. Corbett is to sink a winze on the vein that crosses the San Fernando claim.

TRINITY COUNTY.

M. A. Brady is opening a 2-ft. vein on the head of Little Weaver creek 6 in. of which runs from \$30 to \$40 per ton.

TUOLUMNE COUNTY.

The north cross-cut on the 400-ft. level of the Soulsby mine, operated by the Bagdad-Chase Mining Co., opened a 2-ft. vein that assays over \$100 per ton. This gives 400 ft. of backs on a considerable length of the ore-shoot.

YUBA COUNTY.

The Marysville Quartz Tunnel & Mining Co. has bonded a considerable portion of the Yuba channel near Smartville and is preparing to drill the ground to ascertain its value

for dredging. Considerable rich gravel was washed in this vicinity in early days and some rich, though pockety quartz veins, opened.—It is reported that the Marc Anthony mine is to be bonded and a deep shaft sunk on the property.

COLORADO.

GILPIN COUNTY.

The Fifty Mines Co., at Black Hawk, shipped a \$5000 gold-bar to the Denver mint. The bar was from the Fifty mill which is running on ore that is mined from the Gregory, Bobtail, and Fiske veins from the 1100 to the 1400-ft. level. On the Gregory vein the company has driven 200 ft. at the 1400-ft. level giving 325 ft. of backs. It is expected that the company will sink the Cook shaft to the 1600-ft. level shortly.—Surface water from recent rains has raised the water in the Concrete mine on Gunnell hill above the ninth level so work has been abandoned in that portion of the mine till it is drained by the Newhouse tunnel which will be in about six months if the tunnel is driven at the present rate. The company is breaking a large amount of ore in the stopes, the surplus being sent to the mills at Black Hawk, the rest remaining till the company builds a reduction plant. E. S. Moulton is superintendent.

GUNNISON COUNTY.

The adit of the N. C. B. Mining Co., at Sherrod, is in over 600 ft., and another adit has been started to open a vein northeast of the one the company is now working toward. T. C. Clayton is manager.—The quarries at Marble have been re-opened and a new crew of men put to work. There has been threats of trouble by the strikers so the company has several deputies at the property.—A new orebody has been reported from the Fanny Fern mine near Lake City.

EAGLE COUNTY.

At the Champion mine, in the Red Cliff district, an incline has been sunk 2400 ft. A large amount of development work has been done on the property and regular shipments of sulphide ore are made to the smelters. James A. McKeen is manager.—The Eagle Mining & Milling Co. has opened large bodies of low-grade ore in the Iron Mask mine and has nearly completed a mill for their treatment.—On the Foster claim a shoot of ore has been opened on the surface that assays between 500 and 600 oz. silver per ton.—The Rio Grande Mining & Leasing Co. is opening a body of ore that assays \$60 per ton.

LAKE COUNTY.

A raise has been driven 50 ft. from the 700-ft. point in the Houston adit on a 2-ft. vein of ore that assays 35% lead, 104 oz. silver, and \$14 gold per ton. A. S. Sharp is manager.

OURAY COUNTY.

The average of a number of assays of samples taken from the surface of the Sutton group under bond to the Slick Brothers Mining Co. was \$44 per ton. At one point a trench cut an 18-in. vein that assayed 4000 oz. silver and \$40 gold per ton. This was associated with a gray copper ore and was not included in the average of the samples.—The compressor of the Calliope Mining Co. has been moved into one of the buildings at the Bachelor mine and power obtained from that company. As soon as the adit now under way unwaters the old workings the company will be in a position to commence shipping.—The Amity Gold Mining Co. has completed winter quarters for its men and is working on the adit to open its orebodies at depth. It is estimated that it will require 1500 ft. of work to cut the vein.—One car of ore is being shipped per day from the Morning Star mine which has been leased to Ramstead & Sneva.—The Silver Ledge mine has been unwatered to the 400-ft. level and samples are being taken from the vein. As soon as the water is out to the 500-ft. level a large Cornish pump will be installed and the whole mine thoroughly sampled. Marvin Jessey is superintendent.—Grading for the new compressor and hoist at the Congress has been started and a contract will be let to sink the shaft as soon as this work is completed.

PARK COUNTY.

The company which recently secured ground for a smel-

ter at Alma has commenced grading for the foundations and has given out the statement that the plant will be finished within a year. The company has had ore-buyers in the field for some time and an ample supply of ore is assured.

SAN JUAN COUNTY.

The Continental Mining Co. has driven 700 ft. along the vein on the Buffalo Boy claim. The vein is from 4 to 9 ft. wide, and average samples from the dump ran \$23 per ton, with picked samples assaying over \$4000 per ton. The company is shipping regularly from the Old Abe and Tenderfoot claims and is planning to erect a concentrating mill on the property.

SAN MIGUEL COUNTY.

The Sackett Brothers, of Telluride, who have been operating the Contention mine under a lease for the past year, have opened a body of ore that assays \$3300 per ton. They have also secured the old mill on Bear creek and built a tramway to it from the mine. The mill is now in good order to handle the low-grade ore and the high-grade will be shipped to the smelter.

SUMMIT COUNTY.

A new motor has been purchased to haul the ore from the Wellington mine to the mill. The mill is turning out about 9 tons of concentrate per day.—A long adit is being driven by lessees on the Dunkin property to open the ore at depth. A great deal of rich ore was taken from the upper levels of this property in its early history.—The Rothschild mine, near Argentine, is to resume operations some time this month.

TELLER COUNTY.

Sidney Bartlett and W. F. Burns, operating a lease on block 4 of the Ida May mine on Raven hill, opened a rich ore-shoot at a depth of 42 ft. The vein is from 18 in. to 2 ft. wide, 14 in. of which runs from \$100 to \$200 per ton. The lessees are preparing a trial shipment for one of the local mills.—R. P. Russel has secured a lease on the Twin Sisters mine and is re-timbering the shaft preparatory to opening the property.—Burns & White, leasing block 85 of the Gold Hill group from the Stratton estate, shipped 800 lb. of ore that assayed \$400 per ton. The ore was taken from a narrow seam and a larger shipment is being prepared.—Van Tilborg, Young & Reid are to resume shipping from their lease in the Wilson mine. The cross-cut from the 300-ft. opened 2 ft. of milling ore.—The August production of the Cresson mine was over 3000 tons which is the largest output in the history of the mine. The main shaft of the company is now 1000 ft. deep, and it is expected that the company will commence sinking shortly.—A. E. Carlton has secured a 3-years' lease on the properties of the Joe Dandy Mining Co. The shaft is being re-timbered and the buildings and ore-bins, which were destroyed by fire last fall, re-placed.—The Happy Year Leasing Co. has installed air-drills in its lease at the John A. Logan shaft, and has made arrangements to obtain air from the power plant of the Western Investment Co. Plans are being drawn for the erection of a cyanide on the property. H. W. McRae, of Cripple Creek, is secretary for the company.—A new orebody has been opened on the 540-ft. level of the Aileen mine and nine cars of ore per week are being shipped from the property.—The Doctor Jackpot Mining Co. paid a dividend of \$15,000.—Two cars of \$50 ore was shipped from the Milhoan & Mart lease on the Nightingale mine.

IDAHO.

IDAHO COUNTY.

The 10-stamp mill at the Big Jumbo mine in the Buffalo Hump district has been purchased by M. J. Sweeney and Andrew Prader and is being moved to the Crackerjack property. The Crackerjack is now working on a 50-ft. orebody. There is a 10-stamp mill on the ground and the company is installing a water-power plant to operate the mill and compressor.—Duhrkop & Gribi are opening some good ore on their claims on Moose creek.

OWYHEE COUNTY.

A 500-ft. shaft is being sunk from the Dewey adit of the Trade Dollar mine.—The adit on the mill-level at the Ban-

ner mine cut the vein when in 1500 ft. at a vertical distance of 700 ft. below the outcrop. The vein is 4 ft. wide. Robert Walker is in charge of the work.—A 100-ft. adit on the Berg mine in the Rooster Comb district opened a shoot of oxidized ore. In addition to the oxidized ore, which is free-milling, there is a seam of smelting ore on the foot-wall. H. L. Benson is in charge of the work.

SHOSHONE COUNTY.

Snowstorm mine in the Coeur d'Alene is steadily increasing its output, and at present is shipping 15,000 tons per month. The bad ground cut in the No. 4 adit has been circumvented by driving around it to the west and good headway is being made. The miners got around the break last week, and a little ore has already been cut. They are within 60 ft. of the main orebody in No. 3 adit.—Plans are being made for the enlargement of the Monarch mill, situated east of Murray. The plant now has a capacity of 50 tons per day, and this will be doubled or trebled. The mine shipped several carloads of clean galena and concentrate three years ago, but owing to the expensive wagon-haul to Wallace, shipments were suspended until the completion of the railroad to the mines east of Murray. The Monarch is the most extensively developed lead-silver mine on the north side of the Coeur d'Alene, having 6000 ft. of adits and shaft, and ore reserves approximating 30,000 tons, which has been increased by recent exploration. The concentrate runs about 50%, while the clean galena shipments exceed 60% lead, the average silver content going about 12 oz. per ton.—H. F. Samuels, manager and principal owner of the Success mine in the Coeur d'Alene, announced that shipping will begin in a week. The mill is in working order and mining operations are under way. The work of blocking out the ore has been going on for several weeks, and now stoping has been started. It is expected to ship more than 1500 tons per month.

MISSOURI.

NEWTON COUNTY.

(Special Correspondence).—For the first time in a period of months all the mills in the Spring City camp are active. Five plants have recently started, the Alpha, Alladin, McKee, Microbe, and Sunrise. They will aggregate an output close to 1500 tons per day upon ore running from 5 to 15%. The last plant to start production is the Alladin, built to replace a mill destroyed by fire. Previous to its destruction the company had just opened a rich body of galena ore.—The Hancock is one of the latest developments and is said to be one of the richest. The shaft is down 144 ft., exposing a 12-ft. face of high-grade ore, estimated to run 20%. The entire run has not yet been penetrated, and when it is drifts will be started.—Another large mill is being built in this camp just below the site of the old Delta and will be used to re-work the old tailing pile left from the operations of this plant. There is considerable ore in this waste, as the former mill was not equipped with sludge tables or sand jigs. When the tailing pile is re-worked the mill will be used as a custom plant, as such a mill is badly needed in this camp.

Spring City, September 4.

MONTANA.

MISSOULA COUNTY.

Two miles is the length of a tunnel planned to cut the orebody at a depth of 2000 ft. in the Monitor mine and tapping numerous properties in the vicinity near Saltese. The Chicago, Milwaukee & Puget Sound Railway Co., is reported to be backing the undertaking, the purpose being to control the enormous tonnage. Among the properties which would be tapped by the big bore is the Copper Age, owned by Charles Heidenrich and his associates. The recent important find in a drift on the 700-ft. level of the Monitor, which has been confirmed by H. F. Samuels, manager of the property, has demonstrated that there is commercial ore in that part of the Coeur d'Alene and indicates that another mine will be added to the copper shippers in a short time. The latest find is not the shoot opened some time ago in the upper levels. It is 4 ft. wide, but its length

has not yet been determined. The company has a large crew at work, and as there is already more than a car of high-grade ore on the dump it is likely shipping will begin soon.—The Hemlock Mining Co., operating near Saltese, is making preparations to sink on its orebody. A 150-ft. drift opens galena, copper, and silver ore all the way in. One 60 and one 70-hp. boiler will be put in and a 20 or 30-hp. hoist installed. When this is completed, the shaft will be sunk to the 200-ft. level, after which the vein will be cross-cut and driven upon.

NEVADA.

CLARK COUNTY.

The cross-cut from the 100-ft. level of the Duplex-Contact cut a foot of quartz that is stained with copper and assays well in gold. The plant recently installed by the company is running satisfactorily.—The Yellow Pine Mining Co. is to build a concentration plant at its mine in Goodsprings. J. F. Kent, manager for the company, has been in the lead and zinc districts of the Southeast to study methods of concentration and the plant will be designed similar to those visited by Mr. Kent.

ESMERALDA COUNTY.

The August output of the Goldfield Consolidated Mines Co. was 22,160 tons, which netted the company \$447,000. This includes 150 tons of \$600 ore that was shipped from the Hampton stope. A spur is being constructed from the Consolidated railroad to the Clermont dump and ore-bins with a capacity of 500 tons will be constructed at the shaft so the ore will be emptied into them from self-dumping skips.—The Burke lease on the Belmont mine at Diamondfield has opened a 10-ft. shoot that assays from \$60 to \$75 per ton.—The mill of the National Ore Purchasing Co. at Rawhide has been completed and is running on custom ores. The first ore crushed by the mill was a low-grade lot taken from the Truett claims. The ore is reduced to 1 in. by a gyratory crusher, passes through rolls set to ½ in., is sampled, and is reduced to 30 mesh by two Graupner mills. The pulp passes over Hoyt riffles, through Callow separators, and to Pachuca tanks. From the tanks it goes to a Hunt filter, the solution going to a Merrill press, and the tailing stacked.

LANDER COUNTY.

(Special Correspondence).—The Austin Manhattan Mining Co. has decided to re-open the Union mine. A drift will be run from the lower workings to the Ophir and the latter made the main working shaft. The station at the juncture of the main adit and the Frost shaft has been completed. It is provided with a 60-hp. gasoline hoist.—Lessees on the Golden Eagle have opened a good shoot of ore running \$90 gold and 250 oz. silver.—Several finds of minor importance have been reported from nearby properties during the past two weeks.—Lessees on Nevada-Omaha ground at Battle Mountain have cut a shoot of high-grade ore. The vein is from 3 to 6 in. wide and is said to run \$42,000 at Battle Mountain have cut a shoot of high-grade. The Austin, September 6.

LINCOLN COUNTY.

(Special Correspondence).—The Homestead company is arranging to sink the Fraction shaft to the 1000-ft. level. A new hoist and several machine-drills will be installed. W. H. Perkins is manager.—The Philadelphia-Searchlight has commenced operations with a diamond-drill and will thoroughly prospect its holdings to a depth of 1000 ft.—The Searchlight Parallel will resume operations some time this month.—The Memphis Mining & Milling Co. is arranging for the installation of a hoist and compressor. A. L. Hill is manager.—The Pompeii will start the sinking of its main shaft within a few days.—At the Quartette good ore is coming from the lower levels. The mill is operating steadily.—The Combination reports the uncovering of a 12-in. vein running \$50 to \$200 per ton on the Lloyd claim.—A hoist is being installed at the Eureka Searchlight.—The Santa Barbara Mining & Milling Co. is preparing to install a concentration plant.—The vertical shaft of the Eldorado-Occidental is down 200 ft. with a large body of \$10 ore opened. Cross-cutting in search of

water for the new milling plant is going on. Grading for the mill is progressing rapidly. The plant will have a daily capacity of 50 tons. A. G. Austin is manager.—The Silver Legion company expects to resume work soon. The shaft will be sunk 500 ft. The vein assays from \$10 to \$200 per ton in gold and silver, the latter predominating. John Sartain is superintendent.—The Oxnard has raised funds to sink the shaft to the 600-ft. level. Near the 160-ft. level an 8-ft. body of high-grade silver ore was opened when the mine was last worked.—The entire district is active and a number of properties are being developed.

Searchlight, September 6.

LYON COUNTY.

The citizens of Mason valley have subscribed for \$37,000 worth of bonds of the Nevada Copperbelt railroad and contracts let for the grading and furnishing of supplies.—The Nevada Calumet company near Yerington has instructed its superintendent to draw plans for the construction of a reduction plant.

NYE COUNTY.

(Special Correspondence).—Two veins are being opened on the 500-ft. level of Montgomery Shoshone. The third and fourth levels are producing most of the ore for the mill. The plant is handling about 215 tons per day.—It is reported here that the Goldfield Consolidated Co. is back of the recent improvements to the Mayflower mill and the more vigorous development instituted at the mine.—It is rumored that attempts will be shortly made to resume activities at the Homestake King. Two of the directors are here looking over the property.—Several lessees are working on Tramps with good results. The Vucovitch lease is extracting \$100 ore from a narrow vein and is opening considerable shipping ore.—The Bonnie Clare is showing splendidly. Large bodies of \$18 ore have been opened and the company is arranging for the addition of considerable machinery to its mill. An effort is being made to have the railway companies build a branch line from the station of Bonnie Clare to the mine, a distance of 10 miles. The company offers to guarantee 100 tons of ore per day from its own properties. Andrew J. Trumbo is manager.—The Gillespie lease on Jim Butler reports a 6-in. stringer assaying \$400 per ton. The shaft is down 150 ft.—A. D. Meyers and T. A. Johnson are endeavoring to secure control of the Johnnie Mining & Milling Co. It is asserted that the present board of directors is not handling the property to advantage.—Manhattan quartz mines are evincing considerable activity. At the Stray Dog a station is being cut on the 240-ft. level and an electric pump will be installed. Sinking will immediately follow. Excavation for the new mill is progressing steadily. It is possible that a sampler will be added.—At the Indian Camp a west drift and north cross-cut are being extended from the 120-ft. point.—George H. Bradford has been sampling the ground of the Manhattan Independence Consolidated Co., and if the results justify, it is planned to move the Talmore mill from Rawhide to Manhattan.

Rhyolite, September 4.

WHITE PINE COUNTY.

The August output of the Nevada Consolidated Copper Co. approximated 6,000,000 lb. blister copper.—The raise for the shaft at the Giroux is above the 760-ft. level. The ore is trammed through that level to the Alpha shaft and raised by the Old Glory hoisting equipment which has been recently moved to that point. The Giroux drills on the Butte Ely ground have been in poor material during the past week.—On the Coppermines, Hidden Treasure, Ely Calumet, and other properties of that neighborhood a number of leases have been let and active work commenced on the lead-silver veins of the camp.

NEW MEXICO.

GRANT COUNTY.

The Chino Copper Co. filed incorporation papers with Nathan Jaffa, Territorial Secretary. John M. Sully is the New Mexican representative with headquarters at Santa Rita. The capitalization is for \$3,500,000 in 700,000 shares, \$2,125,000 worth of which has been sold.

OREGON.

BAKER COUNTY.

W. H. Schofield has been investigating the ore supply in the neighborhood of Sumpter and the Seven Devils country to ascertain the possibility of obtaining a supply of ore large enough to warrant starting the smelter.—The Keystone Mining & Reduction Co. has leased the California mine in Cable Cove and is re-opening it. Richard Addoms is manager.

UTAH.

BEAVER COUNTY.

A new company has been formed to take over the Nip and Tuck property. There are eight claims in the group and some good lead-silver ore has been opened. George Weston is manager.—The drift on the 150-ft. level of the Progressive mine is following a streak of rich ore. The Progressive joins producing properties, and it is hoped that the streaks will widen enough to put the mine on a shipping basis.—There are over 100 tons of ore on the dump of the Golden Reef mine awaiting shipment to the smelter. The ore averages \$30 per ton.

SUMMIT COUNTY.

The Little Bell in Park City is now shipping ore from the 700-ft. level that assays 30% lead, 96 oz. silver, and small amounts of copper and gold. A winze has been sunk 259 ft. in ore from that level.—The shaft at the New York mine has been unwatered and sinking resumed.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—Negotiations are in hand for the re-opening of the Tom Thumb mine, now owned by the Midget Gold Mining Co.—During August the New Republic Mining Co. shipped 260 tons of ore. The winze below the No. 4 level of the Republic mine is being unwatered, preparatory to re-opening the fifth. The drift on the vein, southward from the old workings, on the No. 1 level is running on \$100 ore. A cross-cut shows the width of the ore to be 2½ ft.—The lessee of the San Poil mine has driven 200 ft. southward on the vein, on the No. 1 level, and run into a body of ore that assays \$18 per ton.—The Belcher Mining Co. has equipped the tramway from the No. 2 adit level to the ore-bunkers at the upper terminal of the Belcher Mountain railway and placed it in commission. The Belcher mine will soon be in more active operation than ever before in its history. The ore now blocked out in the mine is estimated at about 250,000 tons. A 6-drill compressor is being installed, which will be driven by a 40-hp. engine. The company has leased the Belcher Mountain railway and contracted for the delivery of the first 1000 tons of ore to the Granby smelter, at Grand Forks, B. C.—Work has been resumed at the Oversight mine, and it is reported that operations will soon be resumed at the Copper Key mine.—Jasper King, manager of the Walla Walla mine near Keller, is authority for the statement that the company will install a compressor and drills at the adit it is driving and will increase the force of men at the mine.

Republic, September 3.

JEFFERSON COUNTY.

(Special Correspondence).—The Tubal Cain Copper & Manganese Mining Co. is opening a mine on Iron mountain, in the Olympic mountains, 40 miles from Port Townsend, where four or five veins are to be opened by a cross-cut that will intersect them at a depth of 2000 ft. The cross-cut is now in over 900 ft., and by driving 200 ft. farther the first vein will be opened. These have all been prospected and sampled at the surface, showing the presence of copper glance, chalcopryite, and native copper. Through much of the ore there is some silver and gold. The drill-work is being done by air-drills, the compressor for same being driven by water-power direct, the pipe-line bringing water from the Dungeness river to a Pelton wheel. The mine is reached by a railroad trip of 24 miles from Port Townsend, thence 18 miles by trail. Victor A. Tull, of Seattle, is general manager for the company, and S. Marpel is superintendent.

Port Townsend, September 6.

Special Correspondence.

JOHANNESBURG, TRANSVAAL.

Labor Economy Underground—Rock-Breaking and Shovelings.—Exhaust-Steam Turbines.—First Output of Crown Mines.—Mica and Graphite.—Rapid Development.

The shortage of native labor, felt with particular force by the several companies which have lately erected new mills or extended old ones, is now turning the attention of managers to ways and means for reducing underground labor. The most generally adopted expedient is the use of machines, but hand-stopping in nearly all cases is cheaper per fathom, apart from the advantage that it admits of closer sorting of waste, and often tends to narrower stopes. The use of machines will often result in bringing down several more inches of waste from the hanging wall than when doing hand-work. Small stope-drills give promise of alleviating difficulties, but still hand-labor remains here the cheapest system. With a labor-shortage, there is, of course, no choice and more stopes are constantly being started with machines. Another sort of underground work which provides scope for economy in labor is shoveling in stopes (or 'lashing' to use the local term). The older outcrop mines are much steeper than the newer deep levels, and it may be roughly estimated that half the stopes of the Rand now dip at 35° or less. In some areas a dip of 20 to 30° prevails, and it is in these especially that means can be found to reduce the number of 'boys' or Kaffirs on 'lashing'. The question is periodically brought into prominence. On each occasion there is a formidable array of schemes, and a thunder of arguments. Each time some enthusiast proves conclusively, on paper, how he can save a large amount (10½ to 11½d. per ton seems a popular estimate with those who have not the pluck to claim the full shilling), by some 'new system'. The fact is that each case requires individual consideration. No general rule can be laid down. Chutes are used in many mines with success. Shaking chutes are favored where the hanging wall is good. Aerial gear and gravity planes also have their advocates, and in some properties cross-cuts are run into the foot-wall to meet 'passes' coming from the intermediate stope-tracks. Little reliable information is available as to the relative merits of the different methods. The figures given out are often biased, and are more commonly compiled to support some previous contention than to lead to the cold truth.

Upon his return from the States, after an absence of three years, J. W. Kirkland has delivered a paper upon 'Exhaust-Steam Turbines' before the South African Association of Engineers. The exceptionally large and 'weighty' attendance of members and visitors indicated the recognition of the importance attached to the subject. Mr. Kirkland gave a full description of how profitably and easily the available energy of steam in the lower pressure-ranges of expansion can be transformed into useful work by means of the exhaust or low-pressure steam turbine. He made an estimate of the cost of electrical energy developed by the exhaust-steam from a typical mill-engine room on the Witwatersrand, and on reasonable assumptions arrived at the remarkably low figure of 0.22d. per kw.-hr. including fixed charges. His calculations and conclusions are held to be so startling, that a long discussion is likely to ensue. At the same time, it is safe to declare that more than debate will follow. The possibilities of the low-pressure steam turbine have been engaging the attention of local engineers for a long time, and its introduction will soon be widely seen at the mines and elsewhere. A. M. Robeson, chief mechanical engineer for Eckstein & Co., pointed out their peculiar applicability to provide for increases of compressor-capacity. Time and again the mining engineer calls on the mechanical department for 'more air' (possibly as the result of an unexpected exodus of native laborers and the demand for mechanical substitutes), and then the question

arises how to most cheaply and simply make the increase. It is thought that further stage of compression can be most economically effected on the rotary principle in conjunction with existing reciprocating compressors and prime-movers. Electric power from central stations is now the order of the day. Nevertheless, the exhaust-steam turbine has a great field for service as an auxiliary to steam-plants already erected.

The Crown Mines, Ltd., has declared its first output, and it is interesting to compare the results with those recorded by the East Rand Proprietary, the subsidiaries of which were amalgamated a year before. Tabulated, the July figures were as follows.

| | Crown Mines. | East Rand Proprietary. |
|-------------------|--------------|------------------------|
| Stamps | 675 | 820 |
| Tube-mills | 15 | 15 |
| Tons milled | 132,724 | 154,000 |
| Yield | £213,773 | £222,525 |
| Profit | £109,950 | £106,201 |

Working costs on the former group were 15s. 7.7d. per ton, against 15s. 1d. per ton milled on the latter.

An attempt is being made to boom mica in the northern Transvaal. The mineral occurs in a form and quantity sufficiently promising to attract attention from economic geologists, but there is at present no cause for rejoicing over the advent of a 'new industry'. The promoters of the syndicate attempting to work the deposit have apparently read much literature on the subject of mica and its commercial uses, which course of study might well have been postponed until the possibilities of production are determined. A good deal is also heard of graphite prospects in the northern Transvaal. A venture floated to work a graphite 'mine' in the Zoutpansberg district some months ago appears to be sound and well conducted, and your correspondent, with some experience in Ceylon plumbago, can speak for the high quality of samples coming from the property. The persistence of the vein requires further investigation.

New development records have been made by the New Modderfontein. Two contractors in the East mine made an advance of 826 ft. in 156 consecutive shifts. This was in an ordinary drift, presumably about 7 by 5 ft. The average rate works out at 5.3 ft. per shift; a round, in order to give this advance, must have been blasted every shift. The previous record for the Rand was in the Van Dyk mine, when 323 ft. were driven in 62 shifts, equivalent to 5.2 ft. per shift. The New Modderfontein's achievement is the more creditable in view of the larger period. In both cases two 3¼ Ingersoll Sergeants were used. The most important conclusion to be drawn from these special performances, as from more general experience, is that the East Rand provides better breaking ground than the Central, and that development-costs per foot may be estimated on a lower basis.

NOME, ALASKA.

Wild Goose M. & T. Co.—Union Mine.—Thawing Methods and Costs.—Wonder Dredging.—Dredge-Pool Thawing—Anvil and Ophir Creeks.—Beach-Mining Scheme—Candle District.

The Wild Goose Mining & Trading Co. is operating three hydraulic elevators on Ophir creek, in Council district. Their location on Ophir is 15 above. Operations began in 1900, and the work is profitable. This season work started June 7, and will probably close about October 1. The water-supply has been a little short during a part of this year, although late rains have helped. On Ophir creek this company employs a force of 85 men. The placer-ground, in creek beds and on benches, is 10 ft. deep to bedrock, and the work extends eight miles on Ophir. The company's ditch conveys the water from Parantulk river to the upper end of Ophir creek, thence through the canyon-ditch along the course of the creek, which empties into the Niukluk river, on which Council is situated. The Wild Goose company is also laying a 42-in. pipe-line to carry water from the

Grand Central stream over a divide into the Nome district, for its own use, and to sell to other operators.

Fleming Bros. & Hanks operate the Union mine through two shafts on Flat creek, on the tundra, three miles out of Nome. It is 52 ft. to bedrock. In one shaft a cage and car are operated; in the other a self-dumping bucket of 1 cu. yd. capacity. The shafts are 200 yd. apart, and about the same yardage of pay-dirt is hoisted from one as from the other, each shaft having its own steam plant for hoisting and thawing, using crude oil as fuel. Operations have continued here for some time, and between seven and eight acres of bedrock have been cleaned, the slopes being 4 to 5 ft. high, the pay-dirt taking in from $2\frac{1}{2}$ to 3 ft. of the schistose-slate bedrock, and from 8 to 14 in. of the overlying gravel and sediment. About 2000 ft. of thawing-face is maintained, or 128 steel-points per day; it takes 40 cars, holding 40 pans each, with two men to the car, to handle the ground as fast as it is thawed. The calculation is to take out 10 cars to the point per day. The points, $6\frac{1}{2}$ ft. long, are set horizontally, 18 to 24 in. apart, and one man, skilled in the work, can look after 72 points. In this mine there is no wheelbarrow work, as all the dirt to be hoisted is shoveled into mine-cars. For this work there are 7000 ft. of T-rail track. The seepage of water is considerable, and a centrifugal pump is stationed near each shaft to keep it out of the workings. A force of 70 men is employed, mostly underground, and on an average they hoist 1100 cars of pay-dirt per day. The estimated cost is 65c. per car for thawing, shoveling, hoisting, and sluicing. The principal thawing is done at night, and there is a clean-up of the sluice-boxes every third morning, each clean-up yielding from \$2500 to \$3000. Along with the placer-gold there is obtained a concentrate, consisting of iron sulphide, hematite, and arseno-pyrite, carrying gold and silver, making a product worth \$200 per ton. This mine is fortunate in having plenty of water, the supply being taken from a small lake on the tundra, on the margin of which is the pumping plant. In this is a 40-hp. M. & W. engine, and a 10-in. special Byron Jackson centrifugal pump, running 15 hr. per day. The water is pumped 2000 ft. horizontally, and 34 ft. vertically to the sluices, at a cost of \$21 per day. The distillate used for the engine 60 gal. per day, and costs $20\frac{1}{4}$ c. per gallon. The crude oil consumed at the hoisting and thawing plants amounts to 20 bbl. per day. The operating force, which works harmoniously, is as follows: E. E. Fleming, general manager; W. Stewart Fleming, superintendent; F. O. Hanks, sampler and handler of bullion; Harris D. Longfellow, Geo. W. Glass, John Spencer, and M. Dekks, foremen. This mine, being low-grade, is made profitable by the application of careful and close methods.

The Wonder Dredging Co., managed by E. E. Powell, is operating on Wonder creek, three miles from Nome, in an area of uniform ground. The dredge was built last winter by J. E. Powell and Mr. Lytle, and began work June 12. It is electrically operated, is steam-heated, has 9-cu. ft. buckets, and is calculated to handle 2000 to 2500 yd. per day. The depth from surface to bedrock, is about 60 ft., the buckets taking up about 4 ft. of the schist bedrock, which occurs in partly decomposed slabs. Everything operates satisfactorily, and they anticipate keeping at work till January 1, by enclosing the machinery fully, and keeping the pool heated artificially. Two more dredges are being built and are doubtless now in operation. One is that of the Nome Mining Co., on Bourbon creek, the present dredge being the result of a reconstruction of the one that had an unfavorable record a year or two ago; the other is that of the Gold Beach Dredging Co., on Dry creek, close to town. The Dry creek dredge, reconstructed from one formerly built at Portland, has 5-cu. ft. buckets, and is intended to dredge to a depth of 30 ft., in ground that will have to be thawed. H. Greenberg is financially backing the enterprise. The interest in dredging at Nome is increasing, and many who have claims on the tundra, with insufficient water-supply for sluicing, are interested in watching closely the career of the dredges now operating. The Wonder dredge has a considerable area of unfrozen ground, and so long as it has no thawing expenses its success will be

reasonably certain, as the ground is conceded to be of profitable grade under these conditions. If the others, who have the thawing problem to cope with, can operate at a profit it seems reasonable that other dredges will be built for the frozen tundra. A prevalent idea here is to strip off the top stratum of moss and muck, then thaw and dredge the lower strata to and below bedrock. Bedrock-drainage, as a means of draining off the bedrock so as to avoid the expense of pumping, in connection with drift mining, is considered feasible, and some think such drainage will result in increasing the natural thawing process.

Blanck & Ames have a lease on 20 acres, at No. 1 below, McKay beach, on Anvil creek, and in driving from a shaft and doing open-cut work they struck the extension of Pioneer channel, and have good prospects ahead. This is one of the phenomenally rich parts of the district, where the Pioneer Mining Co., under the management of Jafet Lindeberg, has extracted fortunes. In August, this year, that company made a clean-up of \$80,000 at Anvil creek, as the result of 30 days' operations on Moonlight beach; this was taken from the top dirt, and the bedrock stratum has since been worked.

The Miocene Ditch Co. is operating one elevator on Glacier creek, and is operating hydraulic giants on Grass gulch, at the head of Dexter creek. The work of this company is in charge of B. Deleray. The Blue Goose Mining Co. is operating a dredge on Ophir creek, above Council, on ground leased from the Northern Light Co. Their dredge handles only 1000 yd. per day, and works to a depth of 15 to 20 ft., but this is its fifth season.

Gilbert H. Russell is superintendent, and C. B. Phillips represents the Northern Light Co. The Wilson-Kimball Co. has operated a small dredge at No. 24 above, on Ophir creek this season. C. B. Phillips, Stich Bros. & Patton have been placer mining at the head of Crooked creek, a tributary of Ophir, where they have 3 miles of ditch, 2500 ft. of pipe, giving 300-ft. head, by which they operate a giant, running the wash into bedrock sluices, cleaning up 60c. per cu. yd. The Gold Dredge Mining Co., of Seattle, is undertaking a beach-mining enterprise, under the guidance of E. L. Michot, of New York. They have built a heavy barge on the Nome beach, 32 by 70 ft. in size, in the centre of which is an aperture, or wheel, 11 by 40 ft., through which a steel caisson sinks through the barge into the water and sand to bedrock. This caisson is rectangular, 11 by 22 ft., weighs 10,000 lb., and is raised and lowered from a head-frame. On the barge is a 60-hp. tubular boiler, a 30-hp. hoist, and a steam centrifugal pump, as well as sluice-boxes. The idea is to pump the water and sand out of the caisson, as it sinks to bedrock, and sluice it to recover the gold. When bedrock is exposed it is taken up by pick and shovel, and elevated to the sluices. An air-compressor and receiver are provided for supplying air to the workmen while engaged in the caisson. The equipment is to be tried on Nome beach, and then taken to the mouth of Daniels creek, at Topkok.

The Fairhaven Water Co., composed of New York people, is hydraulic mining on the Innachuk river, where it has 41 miles of ditch, carrying 6000 in. of water per second, deriving its supply from Lake Imuruk. The company is operating three hydraulic elevators, taking up 9 to 12 ft. of gravel and 3 ft. of bedrock, the latter being blue lime and schist. A force of 60 men is employed, G. K. McLeod, of Deering, being manager, with R. D. Adams, of Nome, as consulting engineer. It is claimed that the Innachuk river will yield a production of \$250,000 this season.

The Candle-Alaska Hydraulic Mining Co. has 38 miles of ditch in Candle district, bringing a supply of water from the Kiwalik to the Candle creek diggings, where an area 1200 by 300 ft. has been stripped of its overburden to a depth of 20 ft., to give the gold-bearing gravel below a chance to become thawed by the sun's heat. The pay-gravel is 7 ft. deep, worth \$1.35 per yard. T. C. Noyes is president of the company; R. D. Adams, general manager. The production of Nome district proper, this season, will reach about \$3,500,000; and all of Seward Peninsula, including Nome, \$4,000,000, which is one million less than that of 1908.

TORONTO, CANADA.

**Visitors at Cobalt.—Trethewey.—Rochester Mine.—Kerr Lake —
Cement Merger —Conservation Commission.—British Association.**

Next week the Cobalt district will receive a visit from the members of the Ontario Legislature and great preparations are being made to impress the visitors with the growing importance of the mining industry, and the necessity of various local improvements and legal changes. These include a railroad into the Montreal River district to serve Elk Lake, Miller Lake, and Gowganda, and a reduction in the royalties with which many of the Cobalt mines are handicapped. A strong plea will be made for more generous treatment, both in the way of liberal expenditures in the district, and the modification of the royalty system. The camp is having many visitors from a distance, among the latest being a party of Chicago newspaper men under the direction of A. B. Charlson, of the Grand Trunk Publicity Department, and a number of financiers from Indianapolis.

The Trethewey mine is preparing ground for the installation of a concentrator with a capacity of 100 tons per day. No low-grade ore is being shipped, it being reserved for treatment on the ground. It is expected that the concentrator will be ready for operation about the first of next year. At the Coniagas arrangements are progressing rapidly for doubling the capacity of the mill, and the underground work includes prospecting for new veins as well as extensive development on known orebodies. At the North Cobalt an important find was made recently consisting of a blind vein, 20 in. wide, of high-grade ore. It was struck at a depth of 170 ft. The Rochester has exhausted its available funds and the directors have determined on raising the capital from \$1,000,000 to \$1,500,000, the new issue to be disposed of at 10c. per share or better. The shareholders will be asked to ratify their action at a meeting to be held on September 10. The Waldman mine on the Gillies Limit continues to make a good showing. The shaft is being put down with air obtained from the Provincial mine-plant, and at 10 ft. a large vein was found. Over 16,000 ft. of trenching has been done, and numerous traces of silver found in the Keewatin. On the Young and O'Brien adjoining, in addition to the big Waldman vein, a half dozen good-sized stringers have been unearthed in trenching. The Nancy Helen stock had an upward movement this week in consequence of the striking of a 5-in. vein of high-grade ore in driving on the 60-ft. level. At the Martell location adjoining the Waldman a 12-in. calcite and silver vein has been found. A new and apparently important find has been made at the Kerr Lake, where an orebody 4 to 5 in. wide, yielding 3000 oz. silver per ton was found on vein 7 at the 150-ft. level. A well mineralized calcite vein with cobalt has been found in the cross-cut at the 100-ft. level about 70 ft. north of the main shaft. The Townsite, which has been shut down for some months, is again being operated. About 90% of the stock is owned in England. Diamond-drilling will be carried on extensively. The Ophir is sacking good ore at the bottom of the shaft where a big find was recently made, and the shaft is being sunk from 80 to 100 feet.

The big cement merger, including 10 of the principal plants in Canada, has been accomplished. The Canada Cement Co., Ltd., has been incorporated with a capital of \$30,000,000, of which \$11,000,000 is preferred and \$19,000,000 common stock. The present issues, however, will be \$9,000,000 preferred and \$12,500,000 common, and there will also be an issue of \$5,000,000 in bonds. Four million of the preferred stock will go to pay for the properties absorbed. Sir Sandford Fleming, of Ottawa, is president and the provisional directorate consists of Joseph S. Irvin, Senator Edwards, and John R. Booth, of Ottawa; Robert Mackay, Rodolph Forter, and W. M. Aitken, of Montreal, and Francis B. Dunsford, of London, England.

The Canadian Government, in accordance with an act passed at the last session of Parliament, has appointed a

commission for the conservation of national resources, which will act in co-operation with a similar body appointed by the American Government. It comprises 13 ex-officio members, including several Canadian cabinet ministers, and one from each province, and also 20 other members, each Canadian university being represented. Clifford Sifton is chairman, with power to call the commission to meet at any time, but regular annual meetings are fixed for January. The appointment of this body is the outcome of the international conservation conference which met at Washington at the call of Theodore Roosevelt.

The geological section of the British Association at Winnipeg discussed some interesting papers. W. G. Miller was first on the program with his description of Canada's wealth in ores of gold and silver. After briefly sketching the principal geological features of the ore-bearing regions, Mr. Miller hinted that on account of the wide extent of the Laurentian formation other Sudburys and Cobalts would be discovered. Mining in Canada was distinguished not only on account of the rapid increase in the value of the output but also in respect to the variety and scarcity of the minerals. Placer-mining of gold, lode-mining of free-milling gold, and its ores, was briefly mentioned with short descriptions of typical fields or localities. Silver mining in Canada was chiefly associated with the silver-lead ores at Moyle or Slocan, and the interesting Cobalt camp.

The nickel region warranted special examination as one very distinct in its features and relationships. The great 'eruptive well' of the Copper Cliff region and its consideration by Prof. Coleman, afterward led to a discussion as to whether or not this field presented a possible example of an aqueous rather than an igneous ore-genesis. It was suggested in conclusion that Canada should adopt a nickel coinage in place of the present copper one for cent pieces. J. B. Tyrell opened his description of placer-mining in Canada with a short history of the Cariboo, Wild Horse, Cassear, and Klondyke regions. Most attention was directed to the latter as being at present of importance. The geology of this region was described, the area being an unglaciated one which had been subjected to sub-aerial erosion since Miocene times. He estimated that in the Klondyke section 135 cubic miles of solid rock had been eroded with the consequent sedimentation of the mineral content in the valley-bottom. The placers of the Yukon were thus formed rather from exceptional conditions than from a superior mineral content.

MEXICO.

**Floods at Monterey. — Nazas River Controversy. — Wells Fargo. —
Velardena.—Santa Gertrudis Sold.—Pan-American Railroad.—
General Railway Policy.**

The heavy rains during the past week have caused disastrous floods throughout Mexico. The loss of life and property at Monterey has been appalling. Over two thousand persons have lost their lives, and the property-loss has been estimated at \$20,000,000. Railroads are paralyzed, and all means of communication in the flooded districts are temporarily suspended. A number of railroad bridges have been badly damaged or entirely destroyed. The rainfall recorded at Monterey during 72 hours from Friday to Monday totalled 21½ in. Smelter No. 2 has been badly damaged, and the loss to the steel plant must have been considerable, though at present definite news cannot be obtained. It is stated that thousands of tons of coke have been washed away. Monterey has suffered from several bad floods in the past, and this last terrible lesson will surely deter people from re-building on the low-lying lands on the banks of the river.

News also comes from the South of extensive damage to the Pan-American railroad. Over 88 kilometres of the line is tied up, 9 bridges, and sections of the track, totalling 5 kilometres, are reported as washed away. Great damage is also reported along the Gulf Coast, where a severe cyclone has been raging. At Tampico the light-houses on the breakwater were washed away, and the entrance to the

harbor has been so changed that shipping is delayed pending new soundings.

Don Olegario Molina, in his position as Minister of Fomento, has been principally instrumental in making a settlement of the proportioning of the distribution of the water from the Nazas river. Credit is also due to the engineer, Adalberto Hernandez Loyola, who prepared the reports. The basis of the settlement gives to the holders of water-rights on the upper river 64%, and on the lower river 36%, of the available supply. President Diaz has approved and signed the settlement, and this virtually ends the controversy, with the exception of a suit for damages, now pending, brought by the representatives of the Tlahualillo Dams against the Government.

A number of oil-well drillers in Mexico have formed an organization for purely social and benevolent purposes. Over 100 charter members have been enrolled, and it is expected that all of the oil-drillers of Mexico, numbering about 300, will join. Among the officers of the society are C. E. Patchen, president, and H. Hummel, secretary. The first regular meeting of the Mexican Institute of Mining and Metallurgy was held on August 28 at its new office at Tiburcio No. 22. A regular monthly meeting will be held for the reading and discussion of papers, on the last Thursday of each month.

The Wells Fargo company has reached out a long arm and taken a strong hold in Mexico, a merger of the several Mexican express companies with the Wells Fargo having been made under the name of the Compañia Mexicana de Express. One of the important terms of the agreement with the railroad companies is that the express company is to defray all operating expenses, and is to turn over 50% of the gross earnings to the National Railroads.

The Cruz mines, near Valardeña, in the State of Durango, have been the subject of litigation for the past two years; but adjustments have been made, and it seems probable that the original owners will again take possession and open them up. With this object in view an engineer, Manuel Zepeda, has recently been making an investigation. It is expected that the ores will be shipped to the Torreón smelter. These mines were steady producers in the past, and good profits were made.

After all the statements and counter statements, it now seems to be a definitely assured fact that the Camp Bird capitalists will purchase the Santa Gertrudis mine for \$9,000,000. There has been deposited \$200,000 in the Banco Nacional, on a contract signed by Hugh Rose, acting for the purchasers, and Carlos L. de Landero, president of the Santa Gertrudis Co. The terms of the agreement are subject to the approval of a general meeting of stockholders to be called during September. The price equals \$150 for each of the 60,000 shares.

The Pan-American Railroad Co., which started out with the ambition to build a railroad through the length of the American continent, has never been able to obtain sufficient capital to do more than start the enterprise. The latest development regarding this company is that the American Ambassador, David E. Thompson, is negotiating for the purchase of the whole assets of the company. The sale is not an accomplished fact, nor even definitely assured, as some of the minority stockholders are raising questions. The fact that this line is on the market, subject to purchase, and has not been bought in by the Mexican Government merger, reveals something of the policy of the Government toward the further development of railroad enterprise by foreign capital. In discussing the matter with a high Government authority, it was learned that while it is true that the Government had made a merger of the main lines of the country, and controlled them by holding a majority of the stock of the company, yet it was not the desire of the Government, to in any way retard the development of railroad enterprise by foreign capital, or to demand that natives be given the preference of employment on any but the 'merger lines'. The granting of all concessions is, however, dependent on their termination at the end of 99 years, when, under the existing laws, all the permanent way becomes the property of the Government without further compensation, and the Government has the right of the first option for the

purchase of the rolling-stock. The reason for the desire of the Government to control the leading lines is self-evident to any student of national policies. The Mexican is unwilling to allow the exclusive control of finance and operation of the main arteries to remain indefinitely in the hands of aliens. The Mexican Government still continues to grant railroad concessions with exclusive rights, protecting them for a number of years from parallel competing lines, gives exemption from import taxes on material of construction, and in some cases grants subventions per kilometre constructed, but the effect of the general policy and of the existing laws, is that the control of the principal lines is actually in Government hands, and while foreign capital is encouraged under terms and conditions by which it may recoup itself in a few decades, ultimately, within a century, one by one all of the railroads will become national property.

CHIHUAHUA, MEXICO.

Flood Damage at Monterey. — Manta Mining Co. — Acre Mill for Yquivo District. — Smelters Seeking Silica.

During the night of August 27, and the following Saturday and Sunday, Monterey, in the State of Nuevo León, was visited by an excessive rainfall causing one of the most devastating floods yet known in Mexico. The records show that in 1881 there was, however, quite as heavy a flood in Monterey, but there was not then a large population to suffer, and the loss of life and property was not so great. Rain-gauges show that in the three days mentioned there was a fall of 21½ inches of water. This flowing into the Santa Catarina river, usually little more than a dry river-bed, swelled it to proportions estimated as about one-fourth of the Mississippi at flood-stage, and with a velocity of from 20 to 30 miles per hour. People caught in their homes sought the roofs, expecting the waters soon to subside, but they did not, and the houses being made of adobe soon softened and crumbled and the unfortunates were swallowed up in the seething waters. Thus went groups of 10 and 20 and with one of the school buildings something like 90 that had sought refuge there. It is estimated that fully 2000 people were lost. Over 1000 bodies have already been recovered. Property has been destroyed and damaged to the extent of nearly \$20,000,000, and the loss to the railroads reaches into the millions, the heaviest they have known, and covering the section all around Monterey and for a great distance down toward Tampico, as the railroad and the river follow the same course for many miles. The Santa Catarina river flows along the entire southern border of the City of Monterey, a district inhabited almost wholly by the poorer classes, so that the wealthier suffered but little except through loss of property in the inundated area. Along with the railroads the greatest losers were the smelters situated in the southeastern portion of the city. The Monterey plant of the American Smelting & Refining Co., though rather low, is to the north of the town, some miles from the river, so that it suffered only the natural discomforts of a heavy local rainfall, but at the plants of the Monterey Mining, Smelting & Refining Co., and of the Monterey Iron & Steel Co., the loss was great. That of the Monterey M. S. & R. Co. is said to be close to \$1,000,000. At the steel plant the loss of the coke washed away will exceed \$1,000,000. With other losses to plant and supplies the total estimate for this concern is about \$2,000,000. This is probably more than it can stand. In a considerable flood of but two weeks before it suffered a loss of close to half a million pesos, and for several years it has not been in a flourishing financial condition. It is feared that it may not be able to recover from the present terrible blow.

From Chihuahua most favorable reports continue to be received. At Santa Eulalia the new Manta Mining Co., Ltd., recently mentioned in these columns, operating on the Carmen-Negrita group has found a rich body of lead-silver ore at a depth of but 150 ft. in its new shaft on the Carmen. The Qualey Bros., who within the last few months have resumed development on the Parcionera in Santa Eulalia, have opened a body of good grade lead ore, their previous

product having always been low-grade silver-manganese ore. They expect to resume shipments before the end of the year. At the Qualey's San Francisco mine, in the Yoquilvo district of western Chihuahua, the mill is in course of construction; the first unit will consist of 10 stamps, with tube-mills and air-agitated cyanide tanks. The success of cyanidation throughout Mexico in the treatment of the clean silicious ores has made a great cut in the supply of that character of ore for the smelters, and several of the smelting companies have had to commence mining silicious ores for themselves in order to obtain the necessary supply for flux. Following the lead of the Torreón Metallurgical Co., the Santa Rosalia smelter (which is still running, to the marvel of all who know of the stock-jobbery connected with it) has taken up through its agent, P. Gaudin, several mines in the Parral and Santa Barbara districts and expects to be soon producing its own silicious ores. With the same object in view the Peñoles Mining Co., for its Mapimí smelter, after vainly attempting to contract for ores going to the American Smelting & Refining Co., has taken up the Perla, near Revanche, the Resolana, near the Palmilla, and the Dewey, of Ronesvalles, all tributary to Parral, and will immediately begin working them for the silicious ores.

NEW YORK.

Ohio Copper Sold. — Mascotte Tunnel. — Santa Gertrudis. — Tennessee Copper Bonds.

The International Smelting Corporation will shortly be in a position to announce its ownership of the Ohio Copper mine, in Utah. There is good reason to believe that the International Smelting Corporation now controls the Ohio mine and that Messrs. Cole and Ryan are negotiating with Heinze for the purchase of the Mascotte tunnel which cuts the lower levels in the Ohio property. The tunnel is privately owned by Heinze, and the only way the International Smelting Corporation can obtain it is by purchase. Heinze has been offered a tempting sum for it, and has reason to believe that many of the legal difficulties in which he is involved will be lightened and straightened if he will sell the tunnel. He has had a long conference with representatives of Cole and Ryan, and the International Smelting Co., and as the control of the Ohio mine has been taken away from him, it is probable that he will sell the tunnel. Heinze still has control of the Davis-Daly mine, and will concentrate his efforts to keep it.

The district attorney is still investigating the Ohio-Davis-Daly stock thefts, and the directors of the Windsor Trust company are having a private investigation made of the Trust's connections with the frauds. Little is expected to result from these investigations. George W. Perkins, of J. P. Morgan & Co., has returned from an inspection of the Yukon Gold Co.'s properties, and will at once set about making arrangements for starting a boom on the company's shares on the New York Curb market. The returns from the alluvial workings this summer have been so satisfactory that the directors will be in a position to declare a dividend of 8%. It will be remembered that large blocks of the company's stock were sold to the public at \$9 per share by Thomas W. Lawson, on behalf of the Guggenheims, who formerly owned the properties. As soon as Lawson's advertising campaign ended the stock value gradually receded to \$3. The stock is now quoted at \$5 per share. Some months ago Thomas W. Lawson was engaged in an active copper stock campaign on the Boston and New York curbs. Notwithstanding his costly advertising and press notices the public failed to heed the virtues of his numerous copper properties.

Trinity and other stocks Lawson is interested in remained heavy and he is understood to have taken heavy losses. Activity is again being shown by his stocks and another campaign is reported to be brewing. Brokers who do business with Lawson state that he has re-couped his losses. When the Harriman pool ran the preferred and common stocks of the Union Pacific railroad up to their recent record prices, Lawson is believed to have gone heavily short of both issues, and during the decline sold so advan-

tageously that his profits closely approximated those made by Mr. Harriman.

Advices from the owners of the Santa Gertrudis mine, Pachuca, Mexico, state that John Hays Hammond, acting on behalf of an English company, has purchased that property. Hammond has had an option on the mine during the past three months. His report is said to have been confirmed by those of two well known mining engineers. Hammond recently purchased La Blanca mine, Pachuca, for the Camp Bird directors. The directors of the Tennessee Copper Co. have arranged for the sale of short-term notes amounting to \$600,000. Part of this loan will be used for development, and the balance will be employed in doubling the capacity of the sulphuric acid plant. The company is a member of the fertilizer trust and has entered into large contracts to furnish the trust with acid.

BUTTE, MONTANA.

Gold Dredging in Montana.—Results at Conrey. — Testing German Gulch.

The Tuolumne Mining Co. has begun shipping ore from the new level of the Tuolumne mine at a depth of 1400 ft., but the shipments do not exceed 100 tons per day. The mine is not sufficiently opened and the capacity of the plant is not large enough for a heavy production. An industry of constantly growing importance in Montana is gold dredging, and men and companies interested are searching the State for good placer properties. The results of dredging by the Conrey placer company at Alder, Montana, are attracting capital. The Conrey people and representatives from the California companies have been in Butte during the past week to investigate placers in the vicinity of this city. The Conrey company has been making examinations and tests in Elk Park, near the Great Northern railway, and a representative of a big California company has been examining ground west of the city and another tract in Powell county. The Conrey company started about ten years ago with one steam dredge, on some land at the mouth of the famous old Alder gulch, near Ruby. It was so successful that it gradually acquired several thousand acres of adjacent farm land. The company has now three big dredges working, electricity having been substituted for steam, and it has worked about 200 acres to an average depth of 30 ft., the deepest point to bedrock being 60 ft. The ground yields an average of 20c. per cu. yd., and the three dredges turn out \$35,000 per month the year round. The gold brings \$17.50 per ounce. The gulch has a width of about 600 ft., but the gravel deposit is rather shallow. There is also a good placer near Woodville, the first station on the Great Northern east of Butte, from which considerable gold has been mined, and it is likely that explorations and tests will be made there in the interest of a new dredging proposition. Attention has also been directed to the old placers of German gulch, west of Butte. It is estimated that no less than \$40,000,000 in gold have been taken from German gulch, and the belief is that the deposits ought to be as good as those at the mouth of Alder gulch, though less extensive.

ROSSLAND, BRITISH COLUMBIA.

Diamond Drilling at Le Roi.—Nickel Plate.—Kingston G. & C. Mining Co.—United Mine, Ainsworth.

A contract has been let for the first lot of diamond-drill work to be done in the Le Roi mine at Rossland. The work has been awarded to O. L. Knight & Co., and will keep three diamond-drills in steady operation for the next six months. The hitherto rich South vein will be pierced with diamond-drill holes at intervals of about 100 ft. apart in an effort to find further bodies of ore similar to the lenticular body of \$100 gold-ore opened on the 1650-ft. level some time ago.

At the Centre Star group, the week's shipments were up to standard. The company has begun diamond-drill ex-

ploration of its Enterprise claim. It is said that if work on this claim proves promising, the Consolidated will acquire several adjacent claims, which, from the surface showings, appear to contain big bodies of ore. The surface showings contain extensive low-grade deposits. On the Hattie Brown, in the South Belt development, work still goes on. It is planned to do a lot of diamond-drill work very soon.

It looks as though the dissenting shareholders of the Dominion, at Phenix, would stir up trouble for the recent purchasers of the interests of the old company, if there is any legal way. B. W. Lincoln, of New York, representing nearly \$300,000 in stock and bonds of the old company, looked over the property of the company here last week, stating that this was part of his plan toward working out the program of the shareholders' protective committee. From this district Mr. Lincoln went to Vancouver where he will look into the matter of the sale of the property. It is now reported that the B. C. Copper has acquired a \$500,000 interest in the New Dominion Copper Co., and that a merger has practically been settled upon, the final details only remaining to be arranged. The Mother Lode mine of the B. C. Copper Co. shipped 6840 tons of ore to the Greenwood smelter during the past week; two furnaces are working at the B. C. Copper smelter, and the other one is being enlarged. The shipments from the Snowshoe mine made another record for the past week, the company shipping 4430 tons.

A million-dollar deal has been consummated for the famous Nickel Plate gold mine at Hedley. The affair has been managed by M. K. Rodgers, a mining man of note in this district, and who first brought the Nickel Plate to the attention of the late Marcus Daly. While there is a good tramway and mining plant, also a 40-stamp mill on the ground, it is said the new owners will install a much larger mining and milling plant, and will work the property on a larger scale than heretofore. Now that the V. V. & E. railway has its tracks laid into Hedley, mining in that vicinity will receive an impetus. The Nickel Plate mine has been bought by the Exploration syndicate, said to be strongly backed by Standard Oil and United States Steel capitalists; Frank A. Ross, who has been manager for the last several years, will remain in that capacity with the new concern. Work is being steadily continued on the property of the Kingston G. & C. Mining Co., and it is thought that the work has now led to the line where the prospect changes to the mine-stage.

The United mine, near Ainsworth, has been acquired by J. S. Airheart, now in charge of the Highland and Buckeye properties in the same district. The Highland concentrator is quite large enough to handle the present output of all three mines, so that the ore from the United will be treated there. Shipments have begun from the Highland and Buckeye at the rate of 20 to 25 tons per week. G. B. Squires, lately with the American Mining & Smelting Co. has been placed in charge of the Highland-Buckeye-United group. An addition to the Highland mill is planned by Mr. Airheart. A new lead has been opened up in the Mother Lode mine, Sheep Creek camp, from which samples have been taken assaying over \$400 per ton in gold. The strike was made on the 300-ft. level of the mine, and occurs in a 4-ft. shoot of ore that has been driven upon for some distance.

SALT LAKE, UTAH.

Big Tunnel for Bingham — Silver King Deposits. — International Smelter.—Park City Tunnel.

One of the most interesting propositions that confronts the mine operators of Bingham is the driving of a tunnel that will serve the purpose of every mining property in that camp. The Mascotte tunnel, which is owned by F. Augustus Heinze, has been extended into the mountain from the Salt Lake valley side of the range, over 13,000 ft. to the end-lines of the Utah Copper. This in part solves the problem that confronts the big mines of that district, and in it some interesting disclosures of ore deposits have been made. This channel also affords the cheapest means of transportation in the entire camp, and drains a large

area of ground that could not otherwise be economically mined. As a result of the development in this tunnel it has dawned upon eminent mining engineers that there is a large acreage of mineral-bearing territory that can best be developed in this manner, and that in addition to providing cheap transportation a large territory will be drained and the water will be of value for power, and for the mills and smelters. Engineers have been studying the situation carefully, and plans are shaping so that some large capitalists and mine-owners are to become interested in the project. By extending this channel to the Pine canyon side of the range, such producers as the Utah Copper, Boston Con., Yampa, Utah Con., and a number of others will not only be tapped to considerable depth, but a more economical means of transporting the product will be provided. In the case of the Utah Con., they are already experiencing difficulty with water. The deepest working is down 900 ft., and at this depth they have an immense tonnage of the high-grade ore. This company is pumping and has been for some time. Within a few years a number of other operators in Bingham will experience the same difficulty. It is estimated that the extension of the Mascotte tunnel through the district to an outlet on the Pine canyon side of the range will require 16,000 to 18,000 ft. of driving. The engineers of the various property-owners in the camp have held a number of conferences, and an effort has been made to get each company to share in the work. No arrangement has been concluded, but it is learned that every mine-owner sees the importance of it, and in a measure appreciates the value to the camp of the opening up of such a channel.

A survey has just been completed by the Silver King Coalition Mines Co., engineers of the underground workings of that bonanza in Park City. The development done by this company amounts to 75 miles. Since mining was first started in this property, about 20 years ago, there has been extracted \$25,000,000 worth of ore. There are large ore deposits being opened each year, and one of the engineers estimates that they have ore enough blocked to keep the mine producing at its present rate for 40 years more. Its dividends to date amount to approximately \$12,000,000, and it is distributing profits at the rate of \$750,000 annually, with an extra payment during the holidays, that places the amount at \$1,000,000. The product is a silver-lead ore, and some of this carries gold and copper in paying quantities. The first-class product averages about \$45 per ton, and there is barely enough second-class ore to keep a mill of 150-ton capacity in operation. Active construction is being carried on at the International smelter. Some of the largest buildings, including the power-house, machine-shops, warehouse, and store-rooms are nearing completion. The foundation for the mammoth stack, which is to be 350 ft. in height, is laid. Additional engineers and workmen are being placed on the work, and the management expects to have its bins completed and ready to receive ores by the first of the year. Two of the blast-furnaces will be prepared for blowing-in simultaneously, and enough ore will be on hand from the Utah Con. to start smelting before the contract with that mine goes into effect on April 1, 1910. It is understood that ore from the Giroux mine, at Ely, will be forwarded to this plant until the Giroux smelter is constructed. The Ohio Copper and several other large producers, will also be ready with concentrate by the time the smelter is fully commissioned.

A tunnel is to be driven from the Snake creek side of the Park City district to tap the ore-channel in the Bonanza Flat country. This channel is also to be extended into the Daly-Judge group, and will cut that property below its present workings. The tunnel will be of great advantage to the Daly-Judge, as it will drain its immense territory at considerable depth. It will also be the means of opening up some virgin ground and give other owners of ground in that vicinity an opportunity to work their properties, which they have been prevented from doing by reason of the great amount of water in that portion of the district. Almost all the property-owners will take stock in a company that has been formed for the purpose of driving this tunnel.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Reheating compressed air increases efficiency through increase in volume. There is always loss of heat between the re-heater and the point of application of the air, so that pipe-covering to prevent radiation and loss of temperature is important. It is easy to increase the temperature of the air about 400° F. in passing it through coils in a heater at the rate at which it would be needed for medium-sized mine-pumps. The loss between the heater and the pump might amount to as much as 100°, making an effective increase of 300. In such case, when the air entering the heater was at normal temperature, the increase in volume effected by the re-heating would be about 40%, but the practical net efficiency would only amount to about half as much.

Treatment of zinc ore at Austinville, Virginia, which has averaged about 30% of that metal, and from 8 to 10% lead, has been to reduce in Blake crushers and then in corrugated rolls to 6 m. m. diam., concentrating in log-washers, and in jigs. No re-crushing of tailing is practised. The Wetherill magnetic separator is employed to eliminate the iron-bearing minerals. The capacity of the plant is 90 tons per diem of 10 hours. In addition to the smelting plant for concentrate a zinc-oxide plant has been installed for treating the low-grade ore and tailing, the average content being from 15 to 20% zinc. The oxide produced contains 4% lead and from 70 to 80% zinc. This is sent to the furnace for making into spelter.

Zinc ores in Virginia occur in the earlier horizons (Cambrian to Carboniferous) and are distributed in the Great valley region, including Roanoke, Botetourt, Montgomery, Pulaski, Wythe, Smythe and Russell counties, and also in the Piedmont region of crystalline rocks in Albemarle county. The principal production has been from the Bertha mines, near Austinville, Wythe county. For many years the zinc was produced entirely from the secondary or oxidized ores, and the spelter was of such exceptional purity as to give to this brand a world-wide reputation. Latterly the lower sulphide ores have been developed, which are found to be disseminated through brecciated limestone. The magnesian limestone has been replaced in part by zinc and lead sulphides and by calcite.

Lead-smelting in home-made furnaces is frequently practised, and is often an advantageous way for an isolated mine with rich ore to make a start. It is, of course, wasteful of metal, of fuel, and of labor, and leaves residues which contain much lead and silver, when the latter is present in important amount. The ore-hearth is one of the favorite furnaces for this kind of work, and requires comparatively little skill. A description of such an appliance and the mode of operating it, cannot well be condensed within the limits of a concentrate. Essentially it is a deep forge, with one or more tuyeres

or blast-inlets at the back, which is closed with a wall, the blast being deflected downward. The front of the hearth has an apron on which the operator works to break up sintered masses in the charge. The sloping-hearth reverberatory furnace (Bleiberg type), is preferable with very rich ores, as it leaves cleaner residues, and requires but little more skill than the ore-hearth.

Sand in launders should move at a velocity of about one-half that of the transporting current for maximum efficiency. The diameters of bodies which can be moved by a current vary as the square of its velocity, and their weights as the sixth power of the velocity. As the weight of sand immersed in water is less than in air, according to the respective specific gravities of the particles, they are relatively more easy to move than their absolute weight would indicate. Quartz pebbles 1 in. diam. will roll along a channel when the current-velocity is 3½ ft. per second. A common cause of trouble with the clogging of launders is in the preponderance of relatively flat grains, which are not amenable to the laws applicable to bodies of approximately spherical form. Launders are frequently made too narrow. The width should be greater than the depth.

Residual gold-deposits is a term used to express a distinction which is often more a matter of degree than of kind, that is, the term becomes applicable only when the amount of such material is large enough to be of economic importance. Except in situations where rapid erosion occurs almost all gold veins leave a decomposed, enriched superficial zone. This has been variously termed 'residual', 'rooted deposit', and 'saprolite' or rottenstone, the latter originating in connection with the southern Appalachian deposits where they are quite characteristic, often simulating the appearance of placers, and actually become lines of drainage. Thus in the Carolinas it is not uncommon to find creeks following the courses of veins. Some of these residual deposits were extremely rich. Similar deposits are found in Brazil, and a great area of rich saprolites is said to exist in the upper drainage of the Rio Beni in Bolivia.

Cupola practice for melting iron admits of wide variation, dependent upon the size of furnace, character of fuel, and other conditions. Foundry furnaces are made in sizes from 22 to 72 in. diam., inside, at the tuyeres. The smallest size will have a capacity of 1000 to 1200 lb. of pig iron melted per hour, and will require a blast-pressure of about 6 oz. This may easily be supplied by a blower. If charcoal be used for fuel a still lighter pressure will be required. The average economical size of cupola for foundry-work measures 36 in. diam. at the tuyeres. Such a furnace would require about 1 ton of fuel for an ordinary melt, lasting two hours, and would in that period turn out about 7 tons of iron. This would require a blast pressure of 8 oz., and a blast-pipe 12 in. diam. Each charge in such a 'heat' would consist of about 3000 lb. iron, 150 lb. coal, and 75 lb. coke, starting on an original fuel-bed of 1000 lb. coal.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Aliens' Rights in Mining Claims.

The Editor:

Sir—Knowing that you are in touch with the decisions that interpret the mining laws of the United States, and as most of my work has been done in foreign countries, I would be your debtor if you would answer, through the columns of the MINING AND SCIENTIFIC PRESS, and give me your idea of the legal phase of the following case.

Referring to Section 2319 of the United States mining law, there is found this statement: "All valuable mineral deposits * * * by citizens of the United States and those who have declared their intention to become such, etc."; bearing this in mind, suppose that Juan Silva, a man born in Mexico, and residing in the State of California, but who has not taken out papers of naturalization as an American citizen nor in any way has taken steps to that end, has located a lode claim, and held the same by virtue of doing annual assessment work for five years. He offers the same for sale, and the prospective purchaser, finding that said Silva is not a citizen of this country, re-locates the claim. (1) Can the jumper bring suit against the Mexican to quiet title, successfully? (2) Can the Mexican, by starting proceedings for his naturalization, legally dispossess the jumper? In short, what is your understanding of the legal status of the case?

H. B. KAEDING.

Los Angeles, California, August 29.

[The situation is well set forth in Lindley on Mines, as follows (Section 234): "We think that the decision by the Supreme Court of the United States in McKinley M. Co. v. Alaska United M. Co., to the effect that a location by an alien is free from attack except by the Government, establishes the law that no rights may be initiated by a citizen through a re-location of the ground appropriated by an alien, until the latter's title has been determined by the Government. Prior to that time the ground would not be open to location or re-location. One attempting to re-locate the ground could not connect himself with the Government title, and would acquire no rights whatever. If he should institute an adverse suit based upon such pretended re-location he might assist the Government in preventing the alien from securing a patent, but such a result would not validate his pretended location."

The rights of the alien are thus stated in Costigan on Mining Law (p. 167: "Whatever may have been the intention of the framers of the act of 1872 (Act May 10, 1872, c. 152, 3, 17 Stat. 91; U. S. Comp. St. 1901, p. 1425), with reference to the point, it is now well settled that a location by an alien or the transfer of an existing location to him is valid except against direct attack by the Government while the alien still owns the land, or except when ques-

tioned in an adverse suit where the alien is applying for patent or is adversing."

An alien may locate a mining claim and hold and operate the same indefinitely unless the Government should institute proceedings known as 'office found', but the alien may not proceed to patent. The validity of tenure is recognized, but the title is nevertheless imperfect. This defect is cured by transfer to a citizen, who may then proceed to patent. On the other hand if an alien acquires an unpatented mining claim which has been located by a citizen the alien may not obtain patent. This shows that in the view of the courts the defect lies solely in the disability of the alien to obtain confirmation of title by United States patent.—Editor].

Locating Placer Claims.

The Editor:

Sir—Your article on placer mining locations forming a part of 'Concentrates' in your issue of August 28 conveys the impression, (1) that a person may acquire title to placer mining ground by collusion with the locators, and (2) that a placer location may, legally, be in any form convenient to its locators. This, in my opinion, is against law.

The purpose of the mining Act in limiting a placer location to 20 acres in the case of an individual, and to 160 acres in the case of an association of eight persons, is to prevent, as far as possible, the acquirement of large tracts of placer-ground by a single individual through location. It is axiomatic that what may not be done directly cannot legally be done indirectly. Hence, while one may locate as many separate 20-acre tracts contiguous or otherwise as he may elect, he cannot use his friends or employees in making a location of 160 acres with the understanding that they shall transfer the same to him without consideration, and thus permit him to acquire more land in a single location than he is entitled to as a locator under the provisions of the mining law. The courts uniformly hold that such a transaction is void, and that the location is invalid to a greater extent than the maximum limit which an individual may locate, namely, 20 acres. Of course, any person, firm, or corporation may acquire by bona fide purchase the interest of his or its co-locators or of others, to an unlimited extent.

Placer locations, whether upon surveyed or unsurveyed lands, must conform as near as practicable with the United States system of public land surveys, and the rectangular subdivisions of such surveys, except where such placing of the lines would create a conflict or overlap upon other prior-located claims, or where the land sought to be located is surrounded by prior locations.

The Land Department holds that entries of the mineral lands should be as compact and regular in form as reasonably practicable, and that it will not permit or sanction entries or locations which cut the public domain into long narrow strips or into grossly irregular or fantastically shaped tracts. It lays down the rule that "where a placer location by one or two persons can be entirely included within a square 40-acre tract, by three or four persons within three square 40-acre tracts, and by seven or eight persons

within four square 40-acre tracts, such locations will be regarded as within the requirements where strict conformity is impracticable" (Mining Regulations, par. 30, approved March 29, 1909. See also Snow Flake Fraction Placer, 37 L. P. 250). Ten-acre tracts are dealt with as legal subdivisions, and under the regulations of the Land Department they "may be described, for instance, as situated in the extreme northeast of the section as the N. E. $\frac{1}{4}$ of the N. E. $\frac{1}{4}$ of the N. E. $\frac{1}{4}$ of the section, or, in like manner by appropriate terms, wherever situated."

In other words, a placer location should be rectangular in form, compact, and with east and west, and north and south bounding lines. Whether a placer claim conforms sufficiently is a question of fact to be determined by the Land Office. Each case must be determined in the light of its own facts. It follows that it was an error to state that "the grouping of the eight claims in one association-claim may be according to the desire of the locators."

In conclusion, permit me to say that in my opinion the only legal way to acquire any part of the 'unlimited vacant ground' you speak of is by the 'deed holder' locating the same in one or more separate 20-acre tracts and consolidating the same with the tract now held by him, or by abandoning the original location to the Government and re-locating with seven others who would thus become his co-tenants therein. Of course, if the original or subsequent transfer is collusive, the claim might be reduced to an area of 20 acres.

A. H. RICKETTS.

San Francisco, September 1.

Assessment Work on Placer Claims.

The Editor:

Sir—In a book entitled 'Hydraulic and Placer Mining', by E. B. Wilson, I find the following statement on page 275: "Congress requires no annual expenditures on placer claims, leaving them subject to the local laws, rules, regulations, and customs of the mining district." May I request you to confirm this statement, as it is my belief that it is not true. I have in mind the locating of some placer claims on which no actual recovery of gold in commercial quantities has ever been made, but which have been held for two or more years by a very limited amount of trenching. The dates of some of the location notices are as far back as 1902. According to Wilson's statement perpetual title to such claims is obtained by the mere act of location. The Territorial laws make no provision for annual work, but state that "the size and the amount of annual assessment work to hold possession and acquire patent shall be the same as provided by the Revised Statutes of the United States."

PAUL J. CASE.

Leopold, New Mexico, August 25.

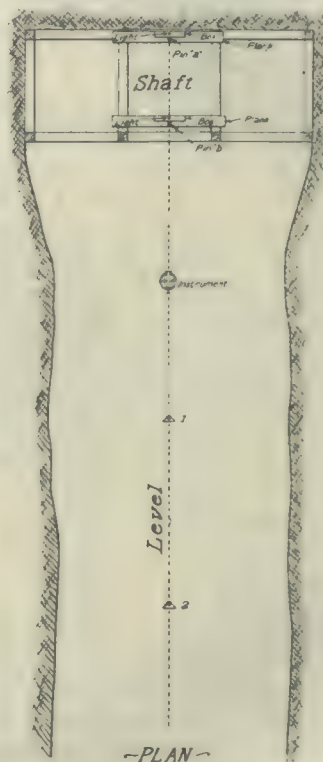
[The quotation from E. B. Wilson's 'Hydraulic and Placer Mining' is correct to the extent that no specific mention of annual assessment work on placer claims is made in the Statutes. The Act under which assessment work is made obligatory referred to lode claims, but the courts have held that it was intended to cover mining claims of every sort, and many decisions, both by the lower courts and by the

Supreme Court, have established the requirement as applying to placer claims as fully as to lode claims. Hence it is imperative as a condition of tenure to perform \$100 worth of work annually upon each individual or association-claim.—EDITOR.]

Mine Surveying Hints.

The Editor:

Sir—I read with interest H. H. Holbert's letter on 'Mine Surveying Hints', in your issue of May 15, because I have been 'up against' the same problem which he describes in his letter. Transferring the meridian from the surface to the underground workings through a vertical shaft of 1600 ft. and over is one of the most trying problems the mine surveyor meets, especially if the shaft is a wet one. I have tried a number of methods for taking the meridian underground, by triangulation, and otherwise, but I believe with proper care the best results can be ob-



tained with the method mentioned by Mr. Holbert. This is a scheme often employed in the Transvaal deep-level shafts.

The principle of the method I use is the same as that described by Mr. Holbert, but the details are different. After suspending the two wires down the shaft, the instrument is set up about in line with the wires, at the level in the mine where the meridian is desired. Then the point of rest of each oscillating wire, A and B, is determined separately, as follows: A scale is made of sufficient length, say one foot, on a piece of tracing cloth, the divisions being as small as $\frac{1}{32}$ of an inch, the lines being made fairly heavy, with water-proof India ink. This tracing-cloth is then stretched across the open side of a box, and a small lamp or candle is placed inside the box, a hole of sufficient size being cut in the top to prevent the wood catching fire. The illuminated tracing-cloth is placed behind the wire, on a plank stretched across the shaft, and put as near as possible to the wire, and the oscillations noted. So well does the flame il-

illuminate the scale on the tracing-cloth that the divisions are readily seen with the telescope, and an accurate and speedy determination of the point of rest is obtained. The wire is drawn aside, a pin *a*, being driven into the board, to mark the point of rest. The same thing is done with the wire B, the point of rest being marked with a pin *b*.

The instrument is now brought exactly in line with the points *a* and *b*, and the line thrown forward in the cross-cut to 1 and 2. If ten such determinations are carefully made, and the average taken, this method is, I think, as accurate as any. It is a quick one as well.

The surveyor of a 'deep-level' mine in the Transvaal generally uses this method to get a connection between the two vertical shafts. After the first connection is made, he frequently carries his meridian underground by means of the 'one wire in each shaft method' (See Brough's 'Treatise on Mine Surveying', page 208), especially if there is a discrepancy of a few minutes when the tie is made through the connection. Where the boundary lines underground have to be determined with the accuracy necessary in the Transvaal, too great care cannot be taken in carrying the meridian below ground. This is the starting point of the underground surveying, and all the accuracy in the world in subsequent work will not make up for an error in taking the meridian underground.

T. LANE CARTER.

Ocongwas, Nicaragua, June 29.

Rejection of the Yard Mining Claims.

The Editor:

Sir—The decision rendered by the Department of the Interior, July 3, 1909, in the case of H. H. Yard, etc., raises a question of considerable interest and importance. The following language was used by the Assistant Secretary in deciding the case; though it was not essential to support the decision, there being other reasons given as the main basis of the opinion:

"So far as the evidence shows, no discovery of mineral was made prior to the making of the 'paper' locations, that is, the posting and recording of the notices of location. These claims, in the majority of instances, were transferred either to H. H. Yard or to the North California Mining Company, a corporation. The appellants maintain that, even if no discovery was made before the locations, any subsequent discovery operated to validate the claims. Such alleged subsequent discoveries occurred as is shown by the evidence, during the spring and summer of 1907, and at a time when the asserted locations were claimed and owned either by Yard or the company. Does a discovery under such circumstances serve to validate a claim of 160 acres? It is conceded that a single discovery upon a maximum placer location held by eight persons is primarily sufficient to sustain the location, but the eight associated persons are absolutely essential to the initiation and completion of such a location. When an asserted placer claim of 160 acres, which is invalid, being without a discovery, is transferred to a single individual, it is inconceivable that he alone can perfect

such a location by making a subsequent discovery, seven associates being necessary to initiate and perfect a valid location thereof. The same situation arises as to a claim of maximum area held by a corporation which is in legal contemplation an entity, in which all property rights under the location are vested, the individual shareholders not being co-owners with the corporation or with each other in the corporate property. Repeater and other lode claims (35 L. D. 54). In the opinion of the Department there is no basis for the theory that a subsequent discovery works the validation of a placer claim where the area of the claim exceeds that which the then holders can locate in the first instance. The contrary doctrine would not be within the purview of the statute, but entirely beyond its scope, and unauthorized."

A similar situation arose in the case of *Miller v. Chrisman*, 140 Cal. 440. There the Supreme Court of California, sitting in bank, expressly decided, under similar circumstances where an association-claim of 160 acres had been located and prior to discovery the seven co-locators had conveyed to the eighth associate, who thereafter made a discovery, that the inchoate rights existing prior to discovery were "the subject of conveyance by the associates as well before as after discovery", and the claim was held valid in its entirety. The court said, "We can perceive no reason why the right to prosecute the work and perfect such a location by discovery may not itself be vested in a single one of them."

This judgment was affirmed by the Supreme Court of the United States in *Chrisman v. Miller*, 197 U. S. 313, and while the Federal Court did not comment on this particular phase of the case in its opinion, the judgment of the State Court could hardly have been upheld without affirming the holding made below on this very question. It will be interesting to see whether the Land Department will maintain the position taken in the Yard decision when the question is again squarely presented to it for determination. The matter is of considerable importance in view of the fact that since the final decision in the *Miller-Chrisman* case, it has been the almost universal custom in the oilfields for locators of an association-claim to convey to an individual, usually a corporation, prior to any discovery of oil being made.

WM. E. COLBY.

San Francisco, September 2.

Copper-titanium is valuable for copper castings. Copper, when melting, absorbs gases and is oxidized, to a certain extent during fusion, the oxides dissolving in the metal, with the result that copper cannot be cast in sand directly from the crucible. Auguste J. Rossi, the pioneer of titanium, recommends the addition to the copper of from 1 to 2% of combined cupric and titanic material, for example, an alloy of copper and titanium containing from 5 to 12% of titanium. This alloy is used to the extent of 1 to 2% of the entire weight of copper. Copper treated in this way can be cast in sand, the pouring being quiet, without overflow through the gates, and without piping, and the resulting bars, presenting a close grained, dense structure, free from blow-holes.

THE SOUTHERN ARIZONA COPPER FIELDS.

Written for the MINING AND SCIENTIFIC PRESS
By C. F. TOLMAN, JR.

The data for this paper were collected during a recent visit to Bisbee, Morenci-Metcalf, Globe, Miami-Inspiration, and the Ray camps. They serve for giving a simple description of the ore occurrences and their relation to the local geology, and for a summary of the changes in mining operations that have been made in response to the continued low price of copper. Bisbee, Morenci-Metcalf, and Globe have received careful attention from the United States Geological Survey, and the unraveling of the broader details of the geology by the Government scientists has made possible the detailed geological work that is now being carried on by many of the companies. This work, however, was done some time ago, and for these camps, the attempt is to summarize the critical structural features, and bring out what modifications are now suggested by the later developments.

The new class of deposits recently disclosed in Arizona, namely, the disseminated chalcocite deposits in schist, promises such economic importance that both their novelty and magnitude give interest to any information concerning them. The deposits of the Silverbell camp have, as yet, received no geological description. They present many novel features. Not only are they of considerable economic importance today, but they promise increased production. A short summary of the most interesting points in the geology is taken from notes made during various visits to the camp.

Other important or promising camps in this great copper region, such as Ajo, Courtland-Gleeson, Johnston, Twin Buttes, and Helvetia, present interesting geological relations worthy of careful study and description. The Arizona-Sonora copper fields are not along any straight belt or belts, as has been portrayed in various prospectuses. I have seen outlined two parallel belts, and also two belts at right angles, and in one case two diagonal belts, the crossing of which was made at the properties described. The extensive development of copper deposits in the southeastern part of the territory is, of course, directly related to the geological structure. The northern part of the territory is a vast plateau, covered by formations that are in general later than the period of copper mineralization. This plateau is broken into massive fault-blocks, but lacks the post-Paleozoic intrusions to which the deposition of the copper ore is due. For some distance south of the great escarpment that bounds this plateau region, the formations consist largely of volcanic outpourings, that will always hide, as far as human occupation is concerned, the possible underlying copper deposits. The interesting Gila conglomerate, extensively developed in the main drainage basins of the copper region, is contemporaneous in part with the volcanic formations. Fortunately this covering has been largely swept off the foot-hills, and never covered the mountains so that there is probably not a great loss of mineral area under this deposit.

As shown on the sketch (Fig. 2), the copper

region covers southeastern Arizona and extends into Sonora. The boundaries are not, of course, hard and fast lines, and may be extended with the more careful prospecting of the region. It is an area from which the later formations have been in part or largely removed. The Paleozoic series of quartzites and limestones, often with the underlying 'Pinal schist', appear in the mountains, which frequently show the monoclinical structure, as a uniformly dipping checkerboard of small fault blocks. The acid granitic intrusions are the indispensable factors, and the copper deposits are found in certain restricted areas, near the contact that marks the margin of the intrusion. As there seems to be no regularity in the distribution of these intrusions, there is still less in regard to the deposits themselves. Walter Harvey Weed has discovered (1) that the Schultze granite, classed provisionally by F. L. Ransome as pre-Cambrian, is really post-Paleozoic,

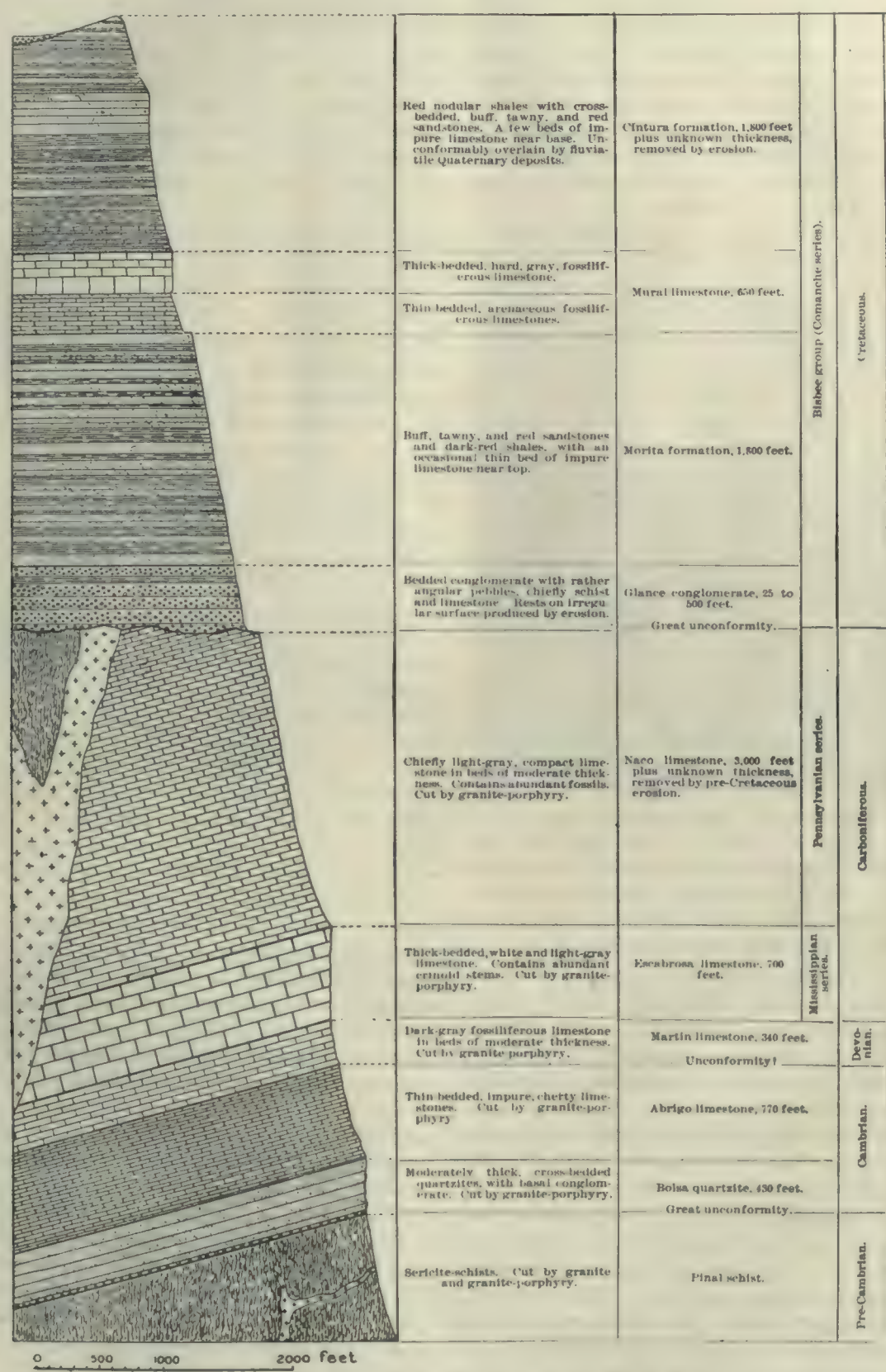


Fig. 1. Verde and Southeastern Arizona Copper Fields.

probably Tertiary. This brings the great Miami-Inspiration copper belt, which develops along the margin of the Schultze granite, in line with the other deposits of the Territory. My casual observations at Ray suggested that the granite and granite porphyry there belonged to this same late date, and J. E. Spurr informs me that his detailed study verifies this conclusion. Reasons will be given later for the writer's belief that an underlying granitic intrusion, this same Schultze granite, and not the diabase, is the origin of the deposits of the Old Dominion group, at Globe. This then brings these deposits in conformity with all other important mines or prospects of the Territory, as far as a close genetic relation to a post-Paleozoic acid intrusion is concerned. A few prospects of the Nacozari type are known in Arizona. The deposits develop in breccia zones in silicified lavas. The most promising of these are found in the Galiuro mountains, but their economic importance has not yet been determined. The Je-

some area and deposits are not included in this discussion.

Pre-Cambrian granites are not believed to develop copper deposits, and as it is important to distinguish these earlier intrusions from the later. Cretaceous 'kindly' formation for copper, and as the indications are quite different from those of the better known types of deposits, these indications will be discussed during the description of the Miami and Ray properties.



GENERALIZED COLUMNAR SECTION OF THE ROCKS OF THE BISBEE QUADRANGLE

Fig. 2.

teria for this purpose are given later. The greatest interest at present attaches to the deposits in the schist, and as there has existed a strong prejudice in the minds of prospectors against schist as a

Figures are notoriously uninteresting, but a few vital statistics are necessary if we would gain a definite mental picture of the importance of an industry. The production of Arizona can be taken to

represent that of the southern field under consideration, for although Clark's mines at Jerome and the adjoining properties are thought by some to be a separate field, and belong to a different class of deposits, formed at an earlier geological period, Cananea more than makes up for this loss. Geologically it belongs to the southern Arizona field. In round numbers Arizona has produced since 1880 two and a half billion pounds of copper, which, with the by-products, has yielded somewhere near \$400,000,000. Since 1906 Arizona's yearly product has exceeded a quarter of a billion pounds of copper, last year the production reaching 288,885,644 lb. out of a total for the United States of 952,395,477.

There seems no doubt that the new discoveries in disseminated deposits will keep the southern Arizona copper field at the head of the copper producing areas for many years, if not indefinitely. Indeed the question often discussed among those acquainted with the recent developments is: what are we to do with the flood of copper soon to come from Arizona's disseminated deposits? Is this class of deposit, with its low cost of production, going to drive the older mines out of business? As an answer to this question we may guess what will be the increase two years and again five years from now from these discoveries. Two years from now Miami will be producing about 25,000,000 lb. from the 2000-ton mill. Ray very possibly will reach 60,000,000 from the 5000-ton mill planned. This is an increase of about 30% on Arizona's present production.

A loss rather than a gain is to be expected from the old established mines, so that the present outlook suggests not much more than a doubling of Arizona's output. This means an increase from Arizona of $\frac{1}{2}$ of the present yearly world's production of copper. As nowhere else (with the possible exception of Africa and Chile) is there promise of developments approaching in value the recent finds in Arizona. It is not difficult to believe that advancing industry will consume without difficulty all the production from Arizona's new mines.

THE BISBEE COPPER FIELD.

It is hardly necessary to repeat in detail the history of Bisbee, the greatest of the Arizona copper deposits, and the third copper mine of the country, or more than to mention, in regard to its location, that it is in the southeastern part of the Territory, in Cochise county, and only a few miles distant from the International line. The Copper Queen was first located in 1873, was abandoned and re-located the next year; shortly afterward a third interest was wagered, won, and lost on a foot-race. The prospecting was done by miners from Tombstone, and from the Turquoise mining district, where Gleeson and Courtland now stand. Now Bisbee is returning the compliment and has built the town of Courtland, and is prospecting the Courtland and Gleeson mines. The statement has been made that the only outcrop of ore in the Bisbee district was an area 60 by 60 ft. This one lens was worked down 400 ft. on the incline. It contained 80,000 tons of ore, and produced 20,000,000 lb. of copper. During this period of muleback transportation and adobe furnaces the property passed into the control of L. Zeck-

endorf & Co., the enterprising Tucson merchants who have owned three of the great properties of the Territory, Copper Queen, at Bisbee, the Ray, and the Old Boot properties of Silverbell. Later Phelps, Dodge & Co. came into control. This fine lens of ore was found, however, to 'bottom' in barren limestone. This was the black time for Bisbee. Col. Herring, now long well known as the leading authority of the Territory regarding mining litigation, was trying to push down to orebodies, but a noted engineer told his backers that ore could not exist at depth in Bisbee. The Queen management gave positive orders to abandon further work, but Howell drove on along a stringer, doing the work against orders, and struck the second great lens of ore, and since then Bisbee has never been at a loss for 'pay rock.' In 1900 another man assisted greatly in the material advancement of Bisbee. Jim Hoatson would not believe that the orebodies stopped suddenly at the Queen's lines and purchased the Irish Mag from out of the Queen's fingers. The latter company wanted the claim, intending to attack the orebody from the adjoining Spray workings. The owner declared that no one could have the mine unless he would agree to start from the surface, and while the deal was held up on account of this ridiculous demand, the Calumet & Arizona intervened, and bought the claim for \$500,000, sank 800 ft. before running a drift, and struck ore. This single mining claim has produced between 100,000,000 and 120,000,000 lb. of copper, marketing for probably not less than \$15,000,000, and on this same claim good ore is still being opened, especially above where the ore was thought to exist on the 600-ft. level.

With the advent of new interests the apex law confronted the companies. All apexes are underground except that of the first discovered orebody, and it would be interesting to know how the courts would have decided the many possibilities. The question was settled in the only reasonable way, by an agreement drawn up by Col. Herring, the Copper Queen attorney, and since copied by other Arizona companies, by which each company renounced any extra-lateral right he might have in the other's property. Since this agreement Bisbee has had no law suits to determine the ownership of the orebodies.

Before F. L. Ransome investigated the Bisbee region, the geology was practically unknown, for James Douglas' excellent description was confined to the ore deposits. Mr. Ransome's work at Bisbee has been a credit to himself and to the Survey, and was of just the character that Government work should be. The general structural relations were worked out admirably. These have been the foundation for the more detailed geological work since carried out by the companies themselves. Fig. 2, taken from Ransome, shows the stratigraphic column. The earliest formation is the pre-Cambrian Pinal schist—then comes a thick Paleozoic series of quartzite and limestones, which has proved to be the locus of the ore mined up to date. Into these the Sacramento stock was intruded. It spreads out into the limestone as a network of dikes and sills. Later

than this intrusion and the formation of the ore, is the Bisbee group of the Cretaceous, important only because it is a covering formation. Here, as elsewhere in Arizona, the mineral-bearing formations were probably completely covered by later rocks. Fortunately the copper districts, after suffering the various 'porphyry' intrusions which gave birth to the copper deposits, generally underwent long-continued faulting movements, which produced elevations of the copper-bearing blocks. These uplifts have given to subsequent torrential erosion points of attack, and these coverings have been removed and deposited largely as detritus in the undrained or partly drained basins ('bolsons' and 'semi-bolsons') and especially on the long slopes leading down into these basins ('bajadas'). At the time the Bisbee survey was made, the very general genetic relationship of the copper deposits to the post-Paleozoic intrusions was not as well established as now, and Mr. Ransome did not consider it to be proved that the Bisbee copper was given off by the Sacramento intrusion and injected into the limestone by the su-

go deeper than expected. The relation of the ore-zone to the limestone syncline is the most important structural relation known to obtain in Bisbee. Of less importance is the relation of the orebodies to lines of faulting and fissuring. The relation of the Denn to the Dividend fault, and of the Shattuck to the Czar fault seems demonstrated. Certain large low-grade sulphide orebodies in the Calumet & Arizona properties are plainly developed along lines of fissuring. The Junction orebodies differ from all other deposits of the camp in that they are not in the ore-zone at all. They are vertical fissure-veins, 20 ft. thick. The ore-zone is calculated to be 600 ft. below these veins, or at the 1800-ft. level of the shaft.

The relation of the ore to the dikes is not shown convincingly in all parts of the camp. The relation



Fig. 3. Ore-Bearing Trough at Bisbee.

perheated waters. It seems now practically certain that this is so.

The three formations upon which interest centres for the mining geologist are the Pinal schist, the Paleozoic limestones, and the Sacramento intrusion. The latter came up along the great Dividend fault (see geological sketch) eating out from this fracture, and extending in ramifying dikes in all directions into the limestones. The large area through which these dikes appear suggests that the porphyry exposure is but the upper portion of an extensive underlying mass, with which these dikes connect. Many dikes have been found in the workings that do not extend to the surface, the upper 'feather edge' having in cases been found. The porphyry did not lift up the sedimentary beds and develop outward dips as is common elsewhere.

The Dividend fault bisects a southeast dipping syncline (see Fig. 3), and the intrusion, perhaps slightly turning up the truncated edge of this syncline, formed a structural trough or scoop, around the porphyry. The ore zone conforms in shape to this scoop, except that it does not dip at quite as strong an angle. The orebodies, however, are not strictly confined to the general ore-zone, they extend sometimes above the zone, as shown by the recent developments in the Irish Mag, and again probably



Sacramento Shaft, Copper Queen Mine.

is most evident in the Shattuck and Arizona, where the porphyry dikes are prospected for ore. Here also 'the lower lime' (Martin limestone?) seems to be the impervious floor above which the orebodies formed. The big orebody on the Del Norte 1300-ft. level is another good example of ore following a porphyry dike. The orebody here forms along the contact, and replaces the porphyry. It is apparent, however, that neither the relation of the ore to fissuring, nor the dikes, is constant enough to form a general guide to the prospecting. The method used is described later.

THE ORE DEPOSITS.

Interest centres in the ore lenses themselves rather than in their relations to geological formations, and structures. So various are their shapes, and so complicated are their alterations, that it is difficult to summarize them. The orebodies consist almost invariably of a kernel of rich ore, surrounded on all sides by a shell of oxidized lode-matter, incased in solid limestone. The upper capping of lode-matter is generally thickest, and looks like masses of lime boulders set in a matrix of mud or clay. The soft material is occasionally pure kaolin, but it generally carries limonite, sometimes mixed with the hydrated oxides of manganese.

This is a variety of the 'iron cap' but here the cap

does not generally come to the surface. In the vicinity of the Shattuck and Arizona, these iron areas show well on the surface, and are really outcropping lode-matter, so that the statement that Bisbee has no outcrops, is hardly correct. The shape of the orebodies is so irregular that it can only be stated that they have a tendency toward a tabular form. This irregularity can be appreciated from the fact that the Copper Queen company is still working 300 ft. from the surface alongside of stopes mined 20 years ago. It may be said that the stoped areas of the largest orebodies, measured in the plane of the ore-zone, may extend over several acres.

It is well known that Bisbee is a camp that has had remarkably high-grade orebodies, the high assay value of which has compensated for their great irregularity. Stopes averaging 16% are reported for the new orebody opened in the Shattuck and Arizona, and even 20% has been known, while 100 ft. represents the average maximum thickness.

The lode matter includes all the decomposition-products separating the ore from the solid lime. In one case Mr. Ransome describes the lode matter as pulverulent running silica. In some stopes small kernels and boulders of ore are found in the white kaolin. When driving through lode matter toward a large ore-pocket the first layer of ore reached is of higher grade than the average, and in the centre the kernel drops in value. In the sulphide bodies, the rich outer shell may be cuprite and native copper, then high-grade chalcocite, and then the grade drops somewhat. While driving through the ore if the grade begins to rise, the miner suspects that he is at the limit of the orebody.

The system of development to explore these irregular orebodies is: (1) to drive in almost any convenient direction until lode matter is struck; (2) this material is then thoroughly explored for ore; (3) when found, the ore is cross-cut and driven upon, and, (4) further development is done by actual stoping, the square set system allowing the following of the ore no matter how it may twist in and out through the lode matter.

UNDERGROUND WATER.

It has been generally supposed that the descending enriching waters of copper deposits are strongly acid, and stay so. Water analyses, made by Mr. Tobelman, chemist for the Calumet & Arizona company, show that in Bisbee the mine-waters are alkaline, except those coming out of open stopes, and, further, an acid mine-water is neutralized by agitation with limestone. It is the acid, thoroughly oxidized, open-stope water that has given rise to mistaken ideas, and I will present later data for believing that, at least for the limestone orebodies and the disseminated deposits in porphyry, the descending copper solutions contain an excess of CO_2 , that the copper descends as bicarbonate or silicate, precipitating, however, in the presence of pyrite as chalcocite, and that the excess of sulphuric acid has been neutralized. The copper waters from the stopes in the Bisbee mines are kept separate from the purer waters, and are elevated to the precipitating plants by separate pumps at the Czar shaft.

Bisbee has always been believed to be a 'lime-

stone' camp, that is, the ore is found only in the limestone. It is not certain, however, that a considerable portion of the completely decomposed lode-matter was not originally porphyry. The Sacramento stock itself is pyritized, but on account of its thorough silicification it has not been amenable to enrichment by descending waters, at least in the one place where it has been tested from the surface down. The Cochise Copper Co. sank its shaft through the schist into the porphyry. Silicification here also has sealed up the rock, the primary mineralization consisting of disseminations of pyrite and chalcopyrite, and networks of small veinlets of quartz with molybdenite, chalcopyrite, pyrite, galena, and sphalerite. It is reported by the miners that the Holbrook orebody, east of the Hospital, was in the Sacramento porphyry, but I did not have the opportunity of personally verifying this report. When viewed in the light of the developments in the porphyry and schist elsewhere in the Territory, it is significant of the great value of the limestone orebodies that the porphyry has received so little attention at the hands of the larger companies, and that the iron-stained schist adjacent to the porphyry intrusion has received practically none.

MINING METHODS.

To one who has visited Bisbee at intervals before, during, and after the great inflation and crash of the copper market, the changes in mining methods that the companies have made in response to the drop in value are interesting. Formerly at the Queen properties, stopes were carried up in large sections, timbers were cut to measure and fitted to a nicety underground. The practice was to take out only sufficient ground for one set at a time, and machine drills were not used in the stopes. Now small stoping drills are used wherever possible, small sections are taken for a stope, and run up quickly and filled in close, allowing a reduction of the size of the timbers from 12 by 12 in. to 8 by 8, and an increase in the height of the sets from 6 ft. to 7 ft. 2 in. Room for two sets is blasted out at one round, and the ore allowed to fall on the floor below, where it can be handled without delaying the work above. Only the main workings are kept open. No attempt has as yet been made to introduce caving methods, or filling methods without the use of timbers, it being maintained by the engineers in charge that the irregularity of the orebodies, and the high grade of the ore, which would make the loss of a few sets of ore a serious affair, forbids the use of any method except the square set. The installation of the electric haulage system, and hoisting by skips from a central shaft, has not only cut down tramming expenses, reducing the average hand-trams to 300 ft., but it has allowed centralization all along the line. For instance, sharpening is all done at one place, the steel being distributed by the haulage system. All this allows more careful supervision and consequent saving.

Separation of sand from slime in a spitzkasten is extremely imperfect unless the pulp-stream be introduced at the head of the apparatus at the proper angle, owing to interfering currents.

DREDGING AT BRECKENRIDGE, COLORADO.

By A. H. BRADFORD and ROY P. CURTIS.

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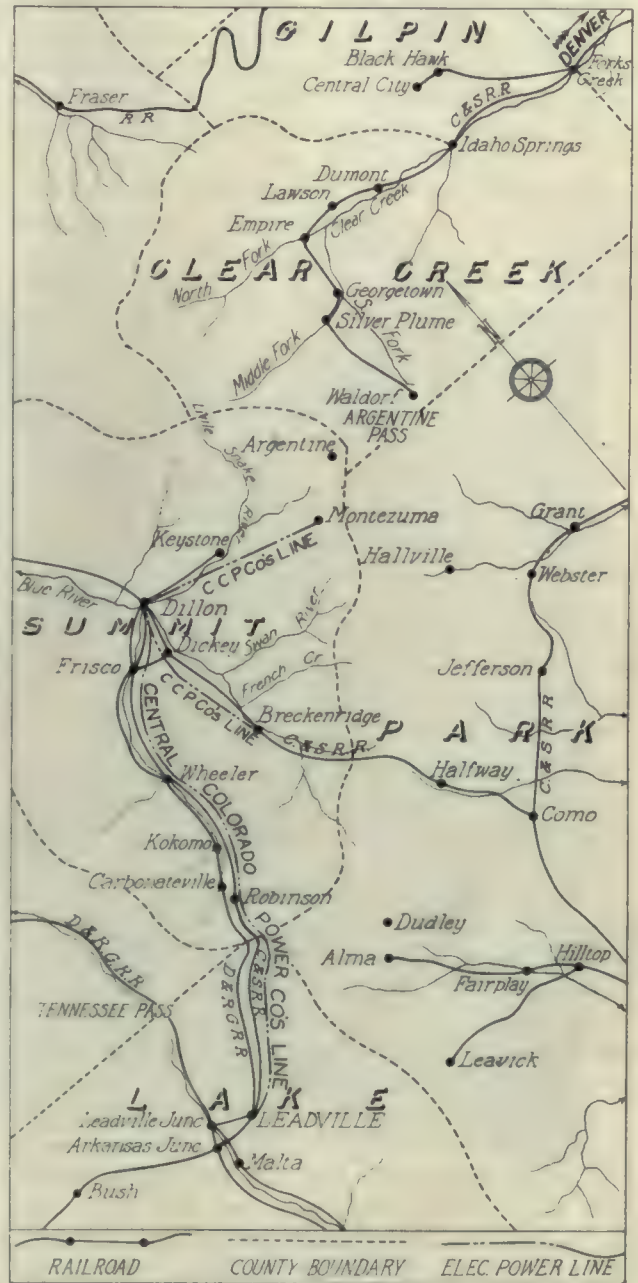
Breckenridge, the county seat of Summit county, Colorado, is situated 112 miles southwest of Denver, on the South Park branch of the Colorado & Southern railroad. The elevation is 9600 ft. above sea. The town has a population of 900. The Breckenridge district embraces the valleys of the Blue, Swan, and Snake rivers, together with the drainage-basins of their tributaries. These streams head on the western side of the main range of the Rocky Mountains, and consequently drain to the Pacific. Gold was discovered in the district during the year 1859, and a typical mining boom immediately ensued. In the early days, the district regulations restricted the length of placer locations to 100 ft., thus making extensive operations impossible. Later, when the 100-ft. titles had expired, and more liberal placer laws to secure a greater acreage had been passed, advanced methods of mining were introduced. In 1872, the booming system of mining was introduced, and later hydraulicking with giants became common. Since that time, both methods have been successfully practiced throughout the district. The first dredging for gold in this district was started in 1900, and since that time, all the advancement has been along this line.

There are few districts in the world more interesting in regard to their geological problems than Breckenridge. It may be described as a complex of sedimentary rocks, eruptive dikes, eruptive sheets, and batholiths. The sedimentaries extend from the Carboniferous to Upper Cretaceous. There are two classes of eruptives. One is a porphyritic diorite, which is found on the top of Mt. Baldy; this rock is usually considered barren, and a poor indication of mineral. The other is a quartz porphyry, and the largest mass is found on Mt. Lincoln; it is often called Mt. Lincoln porphyry. This rock is closely associated with the mineralization. Veins of lead, zinc, and silver occur intimately associated with the quartz porphyry, and placer-gold is often found concentrated upon or near one of these dikes.

One of the most remarkable features of this district is that some of the veins pass entirely through the Triassic limestones, the quartzite, and the overlying siliceous sediments, and contain ore in all horizons.

Extensive glaciation of the gold-bearing rocks about the head-waters of the Blue river and its tributaries has been responsible for the formation and accumulation of the vast amount of placer-gravels found in the Breckenridge district. Glacial gravels in many places cover the slopes of the hills, and the banks of the river and its tributaries. These deposits are known as 'bench placers', and extend all the way from Dillon to Breckenridge. These 'bench gravels' frequently cover the hillsides to a height of several hundred feet. They are comparatively fine as a rule, without clay or large boulders. The largest fragments of rock are generally angular pieces of porphyry and quartzite, retaining strong

evidence of their glacial origin. 'All the early workings have been in these bench deposits. In the present bed of the streams, however, and along their flood-plains are great deposits, varying in width from 100 yd. to a mile in places. These are known as 'river gravels'. They contain many water-worn rocks from 6 to 8 in. diam., with occasional boulders as large as 3 ft. diam. Porphyry is the predominant rock in the Blue and Swan river gravel. These gravels are firmly compacted and cemented by clay.



The Central Part of Colorado.

There is a clay-streak through all the deposits, which is probably derived from the disintegration of the porphyry matrix. This streak is usually richer than the gravel.

The depth of the gravel varies considerably in different places, as it appears to have been deposited on an uneven floor. Near Breckenridge at the Gold Pan workings, the depth is 76 ft. to bedrock; at Dillon, seven miles down the Blue river, it is 79 ft. to bedrock; between these points in the Blue and up the Swan, the depth is from 40 to 45. The Upper Blue, above Breckenridge, shows but little evidence of the influence of waters after their glacial depo-

sition. The deposits are very deep, the boulders large, while the gold is coarse and shows little action of water-wear. These large boulders were the prime cause of the failure of an extensive enterprise on the Gold Pan placer deposit. Below Breckenridge, on the Blue and on the tributary streams to the Blue, the water has modified the gravel to a greater extent. The bedrock of the dredging area consists principally of either porphyry or shale, or shale traversed by dikes of porphyry. The shale is often nearly horizontal. The best gold content is generally found on, or in the oxidized shattered porphyry, or on the top of the shale. The gold is found all the way from the 'grass-roots' to bedrock, and for a few inches or feet into the bedrock. The placer-gold of this district is probably derived more from gold particles disseminated through the igneous rocks, or portions of them, than directly from particular gold-bearing veins, as there are few such veins known in the district. The bulk of the ores worked in the existing mines are lead, silver, and zinc. There are notable exceptions, however, such as the celebrated crystallized gold deposits of Farncomb hill, occurring in fissures in shales adjacent to a mineralized dike of porphyry. The largest nugget ever found in Colorado, known as 'Tom's Baby', 7 in. long by 3 wide, and containing 156 oz. gold, was taken from the Farncomb hill placer. The other gold deposits are principally low-grade impregnations of volcanic rock, particularly of the Mt. Lincoln quartz porphyry. This variety of rock is common in the region and often, in a somewhat decomposed state, forms the bedrock of the productive placers. It is probable that the crushed and mineralized zones and fissures in this rock are responsible for the bulk of the gold found in the placers.

The gold value is generally between 10 and 50c. per cubic yard. While from \$2 to \$20 per yard have been reported from pay-streaks on bedrock, such quantities are rare. Gold pay-streaks occur in channels, not continuous, and the course and dimensions of these can be proved only by drilling or prospecting by shafts. The gold in the placers is coarse rather than fine, due perhaps to not having traveled far from its source. Large nuggets are uncommon, but small ones, half an inch to an inch long, and generally flattened, are not rare. They are rough, rather than water-worn, and sometimes show a 'wire' or crystalline structure. This is particularly true of those found in the placers immediately below the gold deposits of Farncomb hill. The gold fineness gives values per ounce between \$17 and \$18. Black sand occurs in considerable quantity, and is said to have a smelting value of \$75 per ton. The black sand is not all magnetite, and there is much gold coated by iron oxide, wherefore the failure to amalgamate it.

While, in former years, the 'bench gravels' have been extensively worked, it is the lower river gravels that are now the object of attack by modern placer-mining methods. Extensive operations in the past have been carried on by sluicing the 'bench gravels.' The operation of sluicing is simply a mechanical separation, accomplished by means of

flowing water. The gravel is thrown into a sluice through which a stream of water is running, and, because of the relatively high specific gravity of the gold, it settles rapidly through the current, and is caught behind riffles placed in the bottom of the sluice. Various systems of sluice-construction are to be found in the district. Perhaps the earliest work on the 'river gravels' was that done by the Pence Miller Co., in 1898, operating with hydraulic elevators near the mouth of French gulch, and on the Golden Crown placer near the junction of Indiana creek and the Blue river. The Oro Grande Co. also experimented with Evans elevators at about the same time, operating on the Blue river, near Dillon. The combination of a clam-shell digger with an elevator was then attempted by another company on the gravels a few miles below Breckenridge. Even up to the past three years, the Gold Pan Co., operating with a large and expensive equipment of Evans elevators, has done considerable work on the Blue, principally within the city limits of Breckenridge. The past operation on these 'river gravels' has in general proved a failure, due principally to the following reasons. (1.) The elevators were a mechanical failure because of their inability to handle the large boulders often found. Much extra work was required for their removal, thus adding to the operating expense. (2.) The clam-shell digger proved a failure in handling the stiff clay, gravel, and boulders of the district. The 'clam' never shut tight when closed, and thus allowed the fine gold to escape with the leakage water. (3.) In some cases, there was a lack of gold in the spots selected for experiment. In other cases, there was insufficient prospecting of the ground before building expensive apparatus which led to discouraging results and failure. (4.) In some instances, the ground selected for both elevating and dredging was too deep to bedrock for economical working. (5.) The early dredges built here were not adapted to the nature of the ground, being too light for the successful handling of the stiff cemented gravels and the boulders. (6.) Black sand has proved hard to contend with. Large quantities which were at times met, proved a great hindrance, especially on the gold-saving tables. Owing to its high specific gravity, it choked the riffles and prevented the catching of gold in them. The elevator, the clam-shell digger, and the light dredge have all proved failures. They are now succeeded by the latest and most powerful type of dredge, which has proved successful in the economical handling and efficient saving of the gold. Between 1897 and 1900, the North American Dredging Co. operated three dredges on the Swan river. In 1907, this company re-organized into what is now known as the Colorado Gold Dredging Co. The construction of two powerful Bucyrus dredges, at the junction of the Swan and the Blue rivers, marked a new era for this company.

The Reliance Gold Mining Co. operates a dredge in French gulch, about a mile and a half from Breckenridge. It is the oldest machine in the district, and has been in successful use for five years. The conditions met with in the immediate vicinity

are: (1.) Coarse gravel and small rock fragments. (2.) Large boulders. (3.) Streaks of sticky clay carrying the larger portion of the gold. These streaks must be disintegrated before the gold can be saved. (4.) A large percentage of the gold is coarse and rusty, and will not amalgamate. (5.) Large amounts of heavy black iron sand tend to clog the riffles. The dredge was originally driven by steam and is of the double-lift, open-connected type. During the last season, the motive power was changed to electricity, and the dredge remodeled. In a double-lift dredge, the material is elevated twice in its passage through the machine. The material is excavated by an endless bucket-chain, dumped into

The bucket-line consists of 42 buckets and 42 intermediate links, supported by a ladder which can be raised or lowered. The bucket-line is hung upon an upper and lower tumbler, placed at opposite ends of the ladder. The upper tumbler, which drives the bucket-line, is driven at a speed of 10 to 14 ft. per min. by a 200-hp. motor. The bucket-links are pinned to the blank links by forged-steel and manganese-steel pins. The buckets are of 9 cu. ft. capacity, and will dig about 2500 cu. yd. per day. The buckets discharge onto a grizzly with bars 18 in. apart. A stream of water is sprayed upon the material as it is dumped upon the grizzly to wash the oversize before it is discharged into the pond. The undersize



Hydraulic Mining, Breckenridge, Colorado.

a hopper, and screened. The undersize goes to a revolving trommel, and the trommel-undersize to a well in the hull whence it is elevated by means of a centrifugal pump to the sluices, 20 ft. above. Before remodeling the dredge, extraction was effected by means of a sluice, 120 ft. long by 4 wide, attached to the stern of the dredge and floating on independent pontoons. The chief objection to this arrangement was that there were no means for stacking the tailing, and the tailing-pile soon encroached upon the unworked ground, necessitating its re-handling. In remodeling, the dredge was changed by the addition of a stacker and the sluice flume was placed on board of the main hull, thus putting the gold-saving-device wholly on board the boat, and allowing the tailing to be carried far enough away so that there could be no danger of their impeding the operations of the dredge.

passes into a revolving trommel 14 ft. long, by 4 ft. inside diameter, made of $\frac{3}{4}$ -in. manganese-steel plates. The holes are 4 in. diam., spaced about 2 in. apart. At the lower end of the trommel and somewhat above its centre, is set a cylinder, 8 in. diam. by 18 long, attached to the end of a 6-in. water-pipe. This is set at right angles to the trommel, and is fitted with 24 nozzles, varying from $\frac{1}{2}$ to $1\frac{1}{4}$ in. diam., so directed that the water from them will spray the inside of the trommel and wash down the material. The material which passes through the openings in the trommel drops into a well-hole, 15 ft. long by $7\frac{1}{2}$ wide, from which it is taken up by a centrifugal pump and elevated 24 ft. to the discharge-chamber above. The pump is a common single-stage centrifugal, driven by a 100-hp. motor, and discharging into a 15-in. manganese-steel discharge pipe. All the water used in the sluices is also elevated by this

pump. The material is discharged with great force against a manganese-steel plate 30 by 30 in. and 4 in. thick, placed in the top of the discharge-chamber. This chamber is at the head of the sluice and empties into it. It is lined on the top, sides, and bottom with $\frac{7}{8}$ -in. steel-plates. The water carries the material over the riffles with great force. The riffles are set in a flume, which curves first to the left and then to the right, paralleling the centre line of the hull. The object of these curves is to obtain greater eddy-action in the current of water and to give the gold a better chance to settle into the riffles. The result is that over 80% of the saving is made in these two curves. This arrangement also gives a good distribution of weight on the hull. After making these curves, the flume is split into two arms set at an angle of 60° with each other. The main flume is 46 in. wide and 27 ft. long. From its end, the two arms, 26 in. wide, extend for 62 ft. These arms discharge 42 ft. back, and at the side, of the dredge, thus keeping the dredge free from the tailing-pile. The riffles are made of 1-in. wooden slats, $3\frac{3}{4}$ in. wide, set on edge, 3 in. apart, and shod with manganese steel bars, $2\frac{1}{4}$ in. wide by $1\frac{1}{4}$ in. thick. This gives a total depth of 5 in. with a $2\frac{1}{4}$ -in. space between the bars. These riffles are made in sections which are removed when clean-ups are made. The flume has a slope of 1 in. in 12 ft. of length. A 6-in. pipe entering the back of the discharge-chamber supplies water to be used in the clean-up, and also to keep the riffles from freezing when the dredge is shut down.

The oversize from the trommel is discharged upon the stacker-belt and conveyed up an incline of about 16° to the tailing-pile at the stern of the dredge. A 36-in. rubber belt is used, 220 ft. long and $\frac{3}{4}$ in. thick, making 1 rev. per min. The belt is supported by a stacker-ladder, which can be raised and lowered as desired. The belt is driven from the upper end by a 25-hp. motor. The belt conveyor is the source of the greatest trouble when cold weather sets in, as it freezes quickly and, once frozen, it is almost impossible to start it without damage. To overcome this difficulty, the company has placed a cover over the stacker-ladder. A canvas, 60 ft. long by 12 wide is stretched over iron hoops and attached to the ladder by eyelets in the edges. This cover, with the belt, forms a funnel through which warm air from the interior of the dredge-house naturally ascends; this, with the aid of a $1\frac{1}{2}$ -in. steam-pipe, run up and back under the ladder, keeps the stacker from freezing. By the addition of a heating-appliance for the inside of the dredge, and for the exposed parts of the digging-ladder, the necessity for closing during the past winter season was avoided, the Reliance dredge now being able to run all the year round. This innovation is due to Ben Stanley Revett, the manager. This heating is an important factor for consideration, since the months from November to February are severe. Heat is generated by a 30-hp. boiler. As one cord of wood lasts about two days, the cost of heating is not excessive.

Electric power is used. The current is delivered through an insulated cable from a portable transformer on the bank. Alternating current of 13,000

volts is stepped down to 440 at this transformer. Oil-switches are used. They are situated in the pilot house, which is above the upper tumbler. Every operation of the dredge is controlled from this point. The winches (side and rear lines), are started and stopped by a hand-controller, as is also the bucket-line. The pumps and stacker are controlled by starting rheostats. The various drives are controlled by induction motors of the following horse-powers: bucket line, 200; winches (ladder-hoist, spuds, side-lines, and stern-lines), 52; large pump, 100; stacker, 25; trommel, 75; making a total of 425 horse-power.

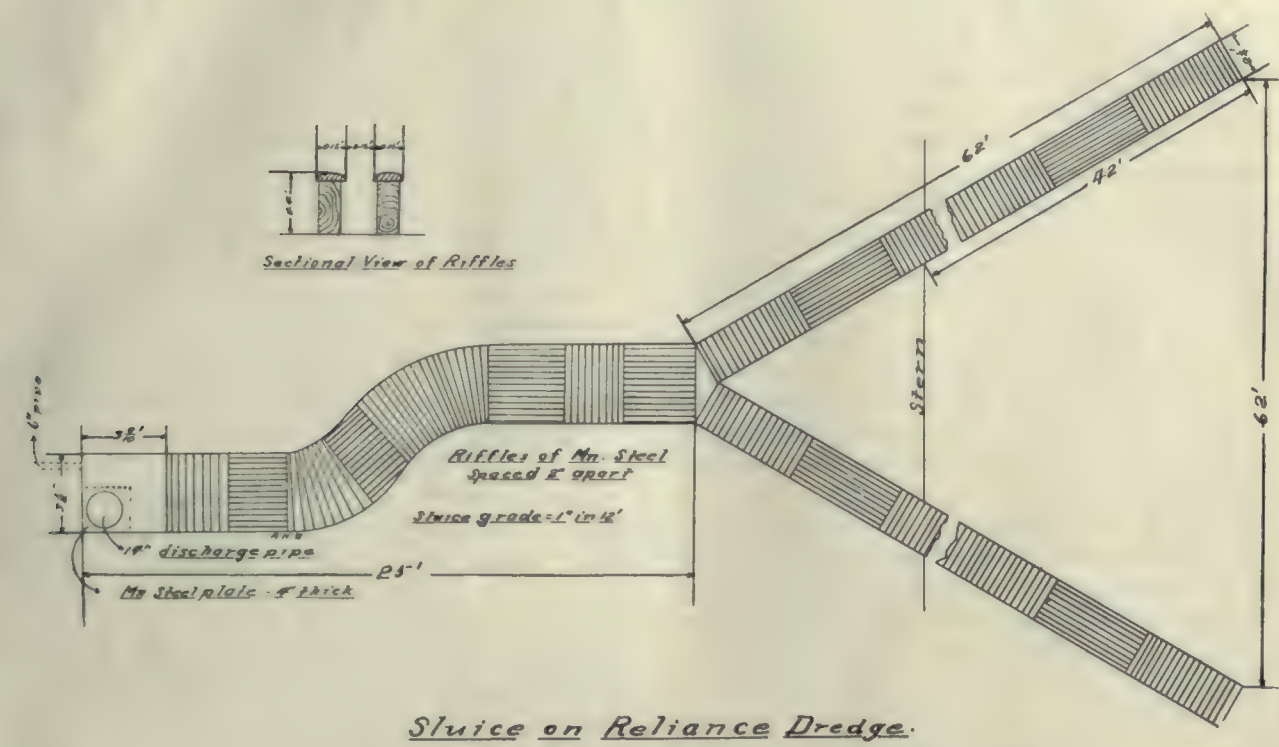
This dredge was designed by Edward Smith, and built to suit the conditions existing in French gulch. It is a combination of several well known types of dredges. The double-lift type was installed with the idea that the powerful flow of water would easily carry and wash the coarse gravel, whereas a lesser flow on the tables would cause a congestion; and that the sticky clay, which carries the rich gravel, would more readily be disintegrated by traveling a long distance and being churned through water under a high pressure, as well as being carried over the deep riffles in the long flume by swiftly flowing water, than by being merely forced through small holes in a trommel, and upon tables to be washed. The advantage assumed for the double-lift in this respect is that the clay is under the disintegrating influence of churning with water for over 100 ft.; with the other type, if the clay is not disintegrated in passing through the screen it is carried over and passed out with the waste and the gold is lost. Pieces of gold which would not pass through a hole of $1\frac{1}{2}$ -in. diam. have been taken out of the Reliance dredge. Consequently, these nuggets would have been lost in the usual sized screen. Again, the long travel would tend to scour the rusty gold and make it amenable to amalgamation. The depth of the riffles on the sluice and the velocity with which the water flows, does away to a great extent with the clogging by black sand.

The Colorado Gold Dredging Co. has two Bucyrus dredges at Valldero, five miles down the Blue river from Breckenridge. One is working down-stream in the Blue river, the other up-stream in the Swan. These dredges have operated but one season. The dredge working up the Swan river is designed to dig 38 ft. below the surface of the water, and the other 48. The latter dredge has worked down the Swan and is now at the junction of the Swan and Blue rivers, and will continue down the Blue. Both dredges are of the open-connected, single-lift bucket-elevator type. The material is excavated and lifted but once, and progresses by gravity from the time it leaves the bucket until it is discharged back into the pit as waste. There are 42 buckets and 42 links in the chain. Each bucket-capacity is $9\frac{1}{2}$ cu. ft., the dredge excavating 3000 yd. per day of 24 hours. The bucket-lips are of manganese-steel. The bucket-line is driven by an upper tumbler, which is actuated by a 200-hp. motor. Except for the length of digging ladders and spuds, the machinery and construction is the same for both dredges.

The buckets carry the material up over the upper

tumbler, and dump it upon a grizzly which ejects into the pond all stones larger than 18 in. diam., by a stone-chute passing over the side of the dredge. The gravel passes through the grizzly into a hopper, and is discharged aft into an inclined revolving trommel, 38 ft. long by 6 diam. This trommel is made of steel plates, 1/2 in. thick. The holes are 3/8

dredge, sloping aft, and extending out over the stern. The material which passes through the 13 1/2 in. square holes at the lower end of the trommel is picked up by the stacker, carried aft, and dropped at the end of the conveyor, thus filling up the pond behind the dredge as it moves forward. The belt-conveyor is supported by a steel latticed frame about



in. diam. at the upper end, 1/2 in. diam. through the middle part, while near the lower end, is a short section provided with 1 1/4-in. holes in order that nuggets larger than 1/2 in. diam. may not be lost by passing out through the double row of apertures 13 1/2 in. square at the lower end. The material after passing through the smaller holes is washed over

100 ft. long, suspended from the stern gantry; this is commonly spoken of as the stacker. The over-size from the 13 1/2-in. holes is discharged at the lower end of the trommel into a chute, and thence over the side of the dredge into the pond. There are four cast-hoops set inside of the screen at intervals of 6 ft. These form obstructions to the material, as they extend inward 3 in. from the trommel-plates, and are so placed in order to aid in disintegration of whatever clay may be in the gravel. Water for washing the gravel over the gold-saving tables is supplied by two centrifugal pumps, a 5-in. and a 12-in. The pumps are driven by a 75-hp. motor placed between them. A large spray-pipe passes through the centre of the trommel. This breaks up any lumps of clay and gravel and washes the material through the perforations in the screen. Pipes across the upper ends of the tables regulate the flow of water over them. Streams of water are thrown upon the bucket



Bucyrus Dredges Beginning Operation, Swan River.

the gold-saving tables. These tables extend across the dredge on both sides of the trommel. The tables are provided with riffles made of strips of wood about 1 in. square, spaced 2 1/4 in. centre to centre. These strips are protected on their upper edges with 1 1/4 by 1/8-in. steel bars. The tables slope 1 1/2 in. per foot. They discharge into sluices at the side of the

while dumping. This washes off any gold clinging to the buckets, which would otherwise be carried beyond the hopper and lost. An 8-in. double-drum winch is placed forward on the starboard side of the dredge. This is used for swinging the dredge and hoisting the heavy spuds. The digging-ladder which carries the buckets is raised and lowered by a wire-

rope tackle leading to a single-drum winch on the port side. This winch is driven by a friction clutch by the 200-hp. motor which drives the bucket-line. On coming upon ground containing a large proportion of fine material, a sand-pump driven by a 75-hp. motor on the stern is started. This sand and gravel is allowed to pass into a sand-box at the end of the tables instead of being discharged near the stern where it would flow forward under the hull and ground the dredge. The sand-pump takes the fine material from the sand-box and carries it through a pipe out along the stacker, and discharges it at a distance from the dredge.

The electrical power for operating the motors is supplied by the Central Colorado Power Co. The total horse-power on each dredge is about 430. The electric power is transformed from 13,000 volts down to 440 volts before leading on board of the boat. The motors operate on 440 volts, and the lighting system at 110. The motors used are: main drive or digging-motor, 200 hp.; sand-pump motor, 75; water-pump motor, 75; stacker, winch, and trommel-drive motor, 25; stacker-motor, 20; winch-motor, 20; deck-pump motor, 15.

The hull is 115 ft. long, 40 ft. 6 in. wide, and 9 ft. deep. The sides are curved inward at the forward end, making the bow 26 ft. wide. An open well, 6 ft. 6 in. wide for the digging-ladder, extends aft from the bow about half the length of the hull. Both the digging and walking-spuds of these dredges are made of structural steel, with extra-heavy cast-iron points. The walking spud weighs 24,000 lb. and the digging spud, 45,000.

About every two weeks, depending on the richness of the ground, the dredge is shut down for a few hours to clean up the gold-saving tables. The riffles are removed and the coarse gravel washed over the stops at the centre and lower ends of the tables, leaving the amalgam and black sand behind. This is gathered up and fed into a 'long tom' rocker. The amalgam and quicksilver are caught in the riffles of the 'long tom'. The amalgam is then drained and retorted.

The Colorado Gold Dredging Co. dredged during the last season at a cost of 8c. per cu. yd., everything included; and as nearly as can be ascertained, the average saving was from 12 to 14c. per yard. The gold-saving under the best conditions is estimated to reach 80%. In California, it has been as high as 85. For purpose of comparison, costs in other districts are here given. In the California dredging fields the average costs are said to run about 5½c. per cubic yard. Under the most favorable conditions, costs as low as 3c. per yard have been obtained. Gold-dredging in Alaska is done under more unfavorable conditions. Much of the ground is frozen and must be thawed. Where the ground is unfrozen, dredging can be done at a rate of from 12 to 40c. per cubic yard.

Nitrate business in Chile is badly disturbed over the dissolution of the nitrate combine that ended March 31, 1909. The price of nitrate has declined materially, and several works have shut down. A strong effort is being made to agree upon some

working basis to control the market and keep up the price. The Chilean government is taking a hand in the matter, since it is deeply interested, as there is an export tax of 56c. United States gold per Spanish quintal of 101.42 lb. On January 31, 1909, there were 145 separate nitrate works in Chile, and it is a difficult matter to get all the interests together. There are several strong companies that own several plants each, and it is among these that the most opposition to combining is found. The following table covers the average cost of nitrate per quintal in United States gold under the conditions given during the month of May for the years 1905, 1906, 1907, and 1908:

| Selling condition. | 1905. | 1906. | 1907. | 1908. |
|--|--------|--------|--------|--------|
| On board steamer in Europe..... | \$2.46 | \$2.38 | \$2.21 | \$2.12 |
| On board steamer in Chile with freight paid | 2.26 | 2.34 | 2.46 | 2.19 |
| Alongside steamer in Chilean port. | 1.84 | 1.96 | 2.13 | 1.79 |

During May, 1909, the price of nitrate was quoted as low as \$1.60 United States gold per quintal delivered alongside steamer in Chilean ports.

Placer-claims to any number may be located by a single individual under the United States mining laws. Where an individual makes the location, a single claim cannot exceed 20 acres, but an individual may locate as many of these claims not exceeding 20 acres, as he sees fit, provided each location complies with all the requirements of the mining laws. Of course local laws and regulations may place a limit on the number of claims that an individual may locate, and the existence of these must be ascertained for each particular locality. An association of eight individuals may include in one placer location 160 acres, and locations may be made by associations of individuals less than eight in number provided the location in each instance does not exceed 20 acres multiplied by the number of individuals included in the association. Unless the State laws prescribe the performance of preliminary or location work, the locator of the mining claim does not have to perform any work until the end of the year following the year in which he locates; by that time he must have done \$100 worth of work for each claim. The claim may rest for the remainder of each year provided this annual requirement of \$100 worth of work is done during the year. If there is a State law requiring a certain amount of work to be done at the time of the location of a mining claim, this, of course, must be complied with and the work to the required amount completed within a reasonable time, when the claim may be allowed to rest and no work need be performed, until the end of the following year. Assuming that 'A' locates a placer claim during July, 1908, and performs all the work required by the State laws, he does not have to do any further work until the end of the following year, and unless he abandons his claim meanwhile, it is not open to re-location until January 1, 1910. A location made by 'B' on January 1, 1909, would not be valid, and if 'A' failed to perform his assessment work during 1909, 'C' could initiate a valid location on January 1, 1910, which would prevail as against both 'A' and 'B.'

TREATMENT OF SULPHIDE ORES IN VICTORIA.

By S. RADCLIFF and J. DREVERMANN.

*For many years it has been the practice at the Bairnsdale School of Mines to treat any parcels of auriferous concentrate sent in by roasting them in a hand-worked reverberatory, and then chlorinating or cyaniding the product. According to Donald Clark, who has done a large amount of work on these ores, the results obtained were fairly satisfactory, extractions of over 90% being claimed. With some modifications, the method has been very generally adopted, not only in Gippsland but throughout Victoria. It is, however, difficult to get exact information as to the extractions actually obtained, and, unfortunately, no records of working results have been kept at the Bairnsdale School of Mines. Having treated several lots of ore by this method during 1907 and 1908 with unsatisfactory results, we thought it desirable to make a detailed investigation on some particular ore, both in the laboratory and on a working scale. The ore selected was a parcel of low-grade concentrate from Stirling, a small mining field about 40 miles east of Bairnsdale. This ore was chosen chiefly on account of the heavy and inexplicable volatilization-loss which took place, even on roasting with the greatest care; the loss amounting to between 10 and 15%. In the experiments here related, three main objects were kept in view: (1) To determine with what mineral or minerals the gold and silver were associated. (2) To gain information as to the cause of the volatilization loss. (3) To see if a satisfactory extraction could be made without roasting.

In endeavoring to answer the question why a given ore does or does not permit of a high extraction of its gold and silver content, a simple analysis of the ore will give small information. The essential point is, not what is the percentage of a given element, but, rather, with what element or elements are the precious metals intimately associated. For instance, the amount of tellurium in an ore may be much under 1% and yet its influence on the treatment is all important. Considering the amount of time and money expended, with moderate success, on some of the Victorian ore deposits, it is surprising how meagre the information as to the actual distribution of the gold and silver is. The case of the Bethanga field may be cited, where many thousand pounds sterling have been expended without arriving at a satisfactory treatment. The ores are exceedingly complex, containing, according to Donald Clark, pyrite, pyrrhotite, arsenopyrite, chalcopyrite, blende, and galena. We have, however, been able to find only two references in the literature bearing on this point, namely, one by H. C. Jenkins, to the effect that all the minerals carry some gold; and another by Clark, who states that "It is probable that the gold is excessively fine, or that it exists in a combined state, probably as telluride." No experimental evidence is given in either case.

In the experiments which we made, the procedure

was, first, the ore was passed through a series of sieves, the separate fractions analyzed and assayed, with the results shown in Table I.:

TABLE I.

| | | Percentage of Assay Insol- | | ore passing. value. ule. | | Fe. | S. | As. | Total. |
|------------------|----------|----------------------------|------|--------------------------|------|------|-------|-----|--------|
| Size of sieve. | through. | Au, oz. | % | % | % | % | % | % | % |
| Original ore.... | ... | 2.6 | 44.9 | 23.1 | 16.0 | 9.0 | 92.9 | | |
| On 30..... | 3.7 | ... | ... | ... | ... | ... | ... | | |
| On 60..... | 57.0 | 1.9 | 53.3 | 21.2 | 16.2 | 8.0 | 97.7 | | |
| On 80..... | 5.7 | 1.15 | ... | ... | ... | ... | ... | | |
| On 120..... | 20.4 | 1.6 | ... | ... | ... | ... | ... | | |
| On 150..... | 5.7 | 1.7 | 42.8 | 26.8 | 19.6 | 9.4 | 98.6 | | |
| Through 150... | 7.4 | 4.8 | 34.1 | 29.9 | 23.8 | 12.3 | 100.1 | | |

The samples marked original ore, on 60 and on 150 all contain lime. As might be expected, the brittle minerals have concentrated in the finest fraction, with a corresponding increase in assay value. This increase, however, is greater than would result from the simple concentration of the sulphides and arsenides. As will be seen presently, this increase is partly due to the presence of finely divided free gold and amalgam.

The finest fraction was then taken and passed through a Richards tubular classifier. In this apparatus the ore particles are subjected to the action of an ascending column of water, the velocity of which can be regulated with precision. Minerals differing only slightly from each other in specific gravity can be readily separated from one another by this means. The material was subdivided into a number of fractions by being repeatedly passed through the classifier; the velocity of the water-column being increased each time. Two of these fractions, one representing the lightest of the sulphur and arsenic minerals, and the other the densest (excluding a small, very dense fraction containing metallic iron, free gold, and amalgam), were taken. These were assayed and analyzed. The results are given in Table II.:

TABLE II.

| | | Assay In- | value. soluble. | | Fe. | S. | As. | Total. |
|----------------------|---|-----------|-----------------|------|------|------|-----|--------|
| Au, oz. | % | % | % | % | % | % | % | % |
| Light minerals | 7 | 29.6 | 34.2 | 26.0 | 9.0 | 98.8 | | |
| Heavy minerals | 5 | 5.7 | 35.9 | 33.3 | 25.0 | 99.9 | | |

Several points of interest may be noted from the results set out in these tables. In the first place there is the marked difference in the assays of the two fractions on, and through, the 150-sieve. Secondly, there does not appear to be any direct relation between the amount of arsenic in a fraction and its assay value. In fact, there appears to be no relation of this kind with regard to any of the principal constituents. The results shown in Table II. are remarkable; the light fraction assaying decidedly higher than the dense one, although the latter contains nearly three times as much arsenic as the former. This result was carefully checked, and it cannot well be due to the presence of free gold. The ore contains, in addition to the constituents shown, minute amounts of lead and copper, and also small amounts of what appears to be tin. It may be noted that the fraction richest in gold carried most of the latter. Further investigations are being made in connection with this sulphide, as its identity is not

*Abstract from 'Proceedings' Australasian Institute of Mining Engineers, May 1909.

quite clear. We have also tested the ore repeatedly for tellurium, always with negative results. The entire absence of zinc is remarkable, as it is commonly a constituent of these ores.

The analytical data throw light on the question of volatilization, or on the treatment-results. It is not at all evident why bromo-cyanide should give such a high extraction as compared with simple cyanide.

While the treatment tests were in progress, the following methods were applied: (1) Roasting and chlorinating. (2) Roasting and cyaniding. (3) Cyaniding the raw ore. (4) Bromo-cyaniding the raw ore.

(1) Gave an extraction of about 15%, calculated on the roasted ore. (2) Gave much lower results. (3) An extraction of 25%. (4) Several tests gave an extraction of 85%, with a moderate consumption of cyanide. The solutions were made up according to the directions given by E. W. Nardin.*

In view of these results, the authors decided to treat five tons by bromo-cyanide. The results tallied fairly close with those in the laboratory, giving an assay of ore before treatment of 2.6 oz., and after treatment of 0.45 oz., the extraction being 81%. A sample of the tailing was dried and sieved. The fractions on the 60 and through the 150-sieve were assayed. The fine fraction assayed 2 dwt. more than the coarse one. Laboratory tests were also made by grinding the tailing to pass through the 150-sieve, and treating further. The extraction was brought up to 85%. In cleaning up the zinc slime all the acid-solutions were examined. A considerable amount of sulphide giving the reactions for tin was collected. This tin must, presumably, exist in the ore as stannite or as some similar mineral, because cassiterite would hardly be soluble in dilute bromo-cyanide.

The above method of treatment seems never to have been seriously tried in Gippsland, and it certainly offers decided advantages over existing methods.

At the Cassilis Gold Mining Co.'s mill, the principal mine in the district, the gold recovered per ton crushed averages a little over 18 dwt., and over 40% of the yield results from roasting and chlorination. Roasting costs 9.91s. per ton, and chlorinating 10.80s., or a total cost of 20.72s. per ton of concentrates. The extraction is stated to be 84.6%. The ore certainly differs considerably in composition from the Stirling ore, and the volatilization-loss may be lower, but some loss certainly takes place. On chlorinating the ore from a neighboring mine, the concentrate being roasted in an Edwards furnace, it was found that considerable loss invariably took place, and this could not be ascribed to simple dusting. Apart from this, however, if a fair extraction can be got, it should be possible to bromo-cyanide the concentrate at considerably less than 20s. per ton.

Gas-engines utilizing producer-gas can develop 1 hp. hour with $1\frac{1}{4}$ lb. coal, producing an efficiency of 22 to 25%. No such efficiency is obtainable when developing and using steam-power.

*Trans. Aust. Inst. M. E., Vol. XII (1907).

SCALING AND SWEATING OF COPPER-BATTERY PLATES.

By SYDNEY F. GODDARD.

*During the month of February, 1908, at the Evaneon mill, north Italy, two outside copper plates, each 12 by 5 in., were scaled and sweated to remove the hard gold amalgam that had gradually accumulated during the previous 50 months' running of a 10-stamp mill, in which period 33,000 tons of quartz ore, averaging 11.74 dwt. gold, and 1.5 dwt. silver per ton, were crushed, of which an average of 10.94 dwt. gold and 1.40 dwt. silver were amalgamated and recovered as bullion, having a gross value of £76,889. The plates were originally silver-plated with 1 oz. of silver per square foot. Before removal, the plates were cleaned up hard, with the clean sharp edges of hardwood scrapers and rubbers until they presented a gray dry appearance, producing in this way 17 oz. of stiff pasty amalgam, which is not included in the return from scaling, as it was in the nature of a daily clean-up, only done in a somewhat more severe manner.

After removal, the plates were placed upon low trestles and sharply tapped with a wooden mallet on the under side, this being sufficient to crack and loosen the skin of hard amalgam, making it come away in thin angular scales. In this way 675.164 oz. of clean dry amalgam was obtained. The plates were then slightly heated over a fire and scraped with steel scrapers, and in this way produced a further 166.119 oz. of amalgam, making a total of 841.283 oz. of dry amalgam, which yielded a 'retort' weighing 331.250 oz. (39.3%) melted to 327.93 oz. bullion, leaving the following fineness, Au 834, Ag 134 (as against the 50 months' average of 875 Au, 115 Ag). The value of this bullion was 273.49 oz. fine gold, worth £1162 6s. 10d. and 43.28 oz. silver, worth £5 8s. 2d., or a total of £1167 15s.

A little amalgam still remained on the plates that could not be easily removed by scraping, together with the small amount it was presumed the plates had absorbed, so they were shipped to London for sale, with the following result:

Weight, before melting, 5 cwt. 2 qr. 7 lb. 0 oz.; weight, after melting, 5 cwt. 2 qr. 4 lb. 6 oz. The assays gave: 55.53 oz. gold per ton, £227 13s. 6d.; 5.30 oz. silver, 11s. 6d.; 97.50% copper £39, making a total value of £267 5s. The above assay indicates that the two plates as shipped yielded 15.372 oz. fine gold, and 1.467 oz. fine silver. The total gross value obtained from the two plates was £1241 15s. Samples of the plates were cut from the lower halves, and tested to determine if they had absorbed any gold. No gold was found in the samples taken. Samples from the upper halves, where the amalgam skin was thickest ($\frac{3}{32}$ in.), only showed traces, and went to demonstrate that only an exceedingly small percentage of gold was actually absorbed by the copper.

Fifteen per cent of the energy of coal is realized as useful mechanical work with the latest type of apparatus, including water-tube boilers, super-heaters, and steam turbines.

*Abstract from Bull. Inst. Min. & Met.

Free Settlement Method of Separating Slime.

Written for the MINING AND SCIENTIFIC PRESS
By HORACE G. NICHOLS.

During the past year considerable work has been done with a view to applying the method of slime-settlement which I described in the MINING AND SCIENTIFIC PRESS, May 22, 1908, to the treatment of slimed ores by cyanide. The many disadvantages attendant upon vacuum filtration methods have been from time to time noted by engineers adopting these processes and the possibilities for a more

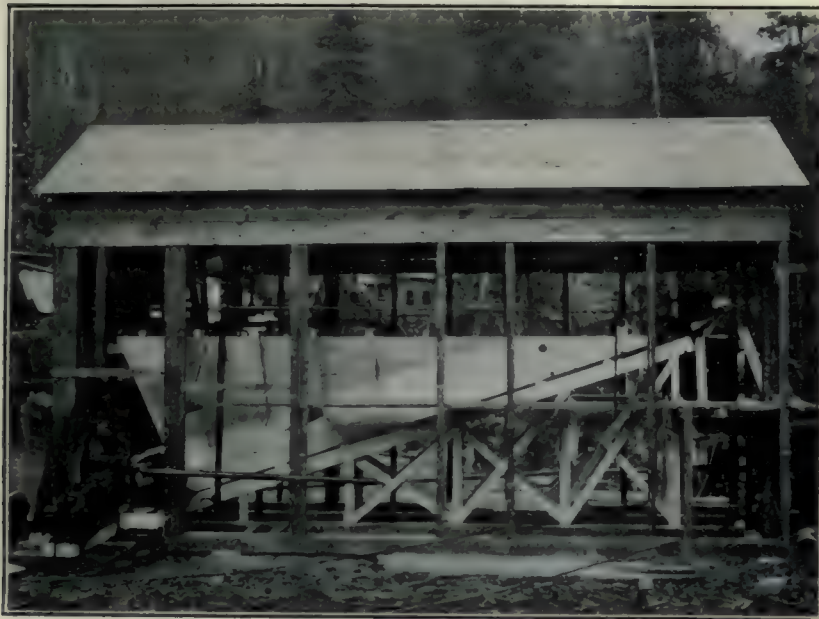
that vacuum filtering is not the last development we shall see in slime-treatment," and the reason for this lack of satisfaction is no doubt to be found in the mechanical difficulties experienced in practice in efficiently carrying into effect the attractive process which vacuum filtering undoubtedly is. The overcoming of these difficulties cannot be accomplished without an amount of care and expense which the simplicity of the separation of solids from liquids would not seem to warrant.

We have the construction and repair of filters carefully attended to in order to provide uniformity of cake as an essential to proper washing, the handling of these filters, the return backward and forward of the pulp, the careful regulation of the vacuum during the time that the cake is exposed to the air, the losses due to osmotic force and the enrichment of the wash solutions, the constant agitation of the pulp in the filter-tanks, the necessity for a fineness of grinding which may not be economically advisable from the point of view of extraction, the intermittent nature of the operation, limitations of washing or cost of installation and operation as disadvantages in one or other of the many processes at present in vogue.

If all these disadvantages can be overcome at once by taking advantage of a principle of free settlement in which the solid particles are assisted to settle out themselves in a continuous flow, and this without dependence upon any variation or regulation in the working of machinery, a great field would be opened up. That this can be done is now proved, and the machinery required is so inexpensive

as to place the process in a class by itself.

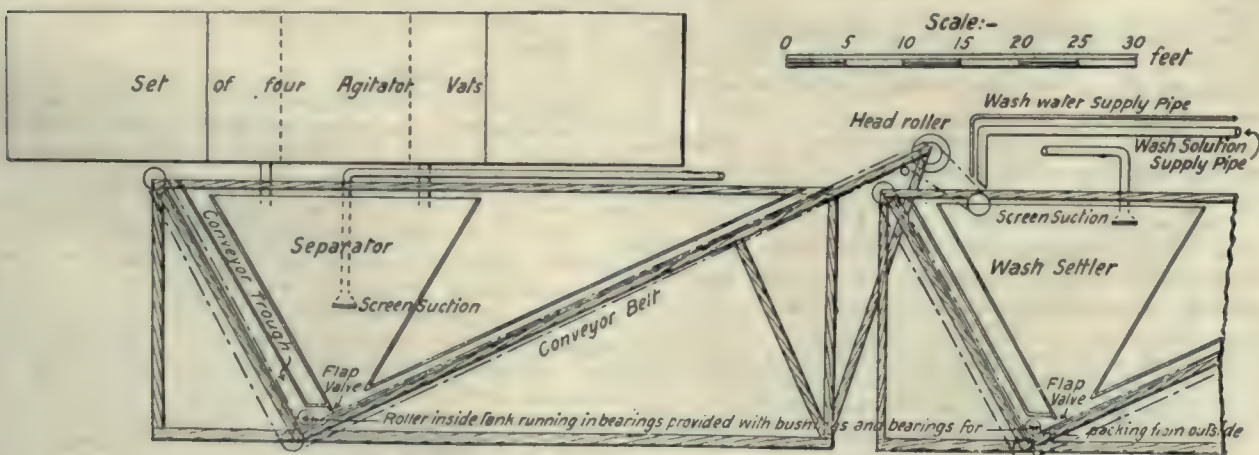
The plant has been working continuously on slimed ore, of which 61% passed 200 mesh, 31 passed 100, and 7 remained on 100 mesh, removing the solids in compact form, carrying 27% moisture, and after thoroughly disintegrating and washing the same, with 3 tons of wash water per ton of



Nichols Slime Separator at Ymir, British Columbia.

simple method, which would eliminate these disadvantages, have justified concentration of attention upon the method indicated.

A plant has been constructed capable of handling 100 tons of fine slime per day and is now in operation at the Queen mine near Salmo, British Columbia. This plant embodies



Ideal Section, Showing Arrangement of Nichols Slime-Separator.

several improvements upon the idea originally suggested. A reference to the accompanying sketch of one unit will demonstrate the extreme simplicity of the plan. As previously described the method is based upon the principle of assisting settlement by removing solids in a settling vessel as they settle, and the truth and feasibility of application may now be said to be amply proved. It may be well to enumerate some of the considerations which led up to the desirability of an improvement upon present methods of slime-treatment. While in no way attempting to detract from the usefulness and ingenuity of the several methods of caking slime, it may be stated broadly that, as R. Gilman Brown has said, it has been "in the minds of many of us

solids, supplied through a spray which washes the load off the belt in the little continuous-flow, air-lift agitator, at the head of the machine, delivering a continuous flow of pulp for separation in a second unit in a similar way. The solution is withdrawn from the top of the pulp where it is thinnest, in fact, the settling action so assisted by the continuous removal from the bottom is so positive as to allow, in a great many instances, simply passing the solution from the top of the tank, which is only just cloudy, through sand filters.

In the plant referred to and in operation, simple filters are used, the pores of which are intermittently cleaned by a back-pressure of air supplied through a double-ended

piston-valve worked by an auxiliary valve, which in its turn is operated by a simple cam-wheel device. One of the principal objections which was originally suggested to the continuous operation of this particular form of machine, in which the belt returns in the tank itself, was that slime would accumulate in course of time in the bottom of the tank. This objection is overcome by the use of two 2-in. pipes shown at the rear end of the tank, which pass down into the tank to within 3 in. of the bottom and act as air-lift columns, a very small amount of air being introduced from below through the $\frac{1}{2}$ -in. pipes also shown. It is to be noted that the top of these pipes is below the level of the pulp. The merest bubble of air is enough to maintain sufficient circulation to absolutely overcome any accumulation of slime, the tank being kept perfectly clear.

Data in connection with this installation, which is standard size, are as follows: belt 2 ft. wide traveling 6 ft. per minute over 14-in. rollers, 25 ft. between centres; depth of tank at deepest part to upper side of belt, 6 ft. 6 in.; width of tank at deepest part, 5 ft. 6 in.; the amount of power required is very small, as may be judged.

It will be seen that the operation is absolutely continuous. There is no variation of vacuum necessary. The perfection of washing is entirely independent of any previous condition or adjustment; it is entirely immaterial whether the pulp treated be of a uniform degree of fineness; sand, slime, or sand and slime, can be handled by this method, and therefore re-grinding need only be carried to an extent demanded for securing economic extraction; there is no mixing of strong and weak solution; no special attention is required; and the necessity for maintaining the solids in suspension during the process of separation, which is an essential feature of vacuum-filtering, is entirely done away with, and in this connection the density of the pulp fed to the machine can be within wide limits. It is this necessity for maintaining suspension that in many cases calls for excessive re-grinding.

Catalogues Received.

The STERNE BROS. Co., San Diego, California, has lately issued a handsome catalogue in which the West Coast gas and gasoline engine is fully described and illustrated.

THE SWEETLAND FILTER PRESS Co., Los Angeles, has just issued its Bulletin D, describing the slime filter recently perfected, and giving results of tests on standard-sized machines.

The INGERSOLL-RAND Co., New York, has issued under date of July its Bulletin No. 4009, giving full details concerning the line of 'Electric-Air' rock-drills now made by that company.

THE J. GEO. LEYNER ENGINEERING WORKS Co., Littleton, Colorado, describes in its Bulletin No. 1007 and 1008 Leyner hand drills and Leyner drill sharpeners, respectively. They will be sent to any one interested.

The WESTERN ELECTRIC Co., New York and Chicago, is distributing a bulletin illustrating the Sunbeam tungsten miniature lamp for use on voltages between $1\frac{1}{2}$ and 20. These lamps vary in efficiency from 0.9 watts per candle-power to 1.33 watts per candle-power, and are desirable for use in automobiles, flash-lights, signs, dental, optical, and surgical instruments. A copy of this Bulletin No. 8-A may be obtained from the Western Electric Co.'s nearest house.

Commercial Paragraphs.

The ALLIS-CHALMERS Co., Milwaukee, has entered the field as manufacturer of machinery for sand-line brick and employed as commercial engineer, Franklin Henshaw.

MORGAN & Co. announces that it has succeeded to the business of the Brausch-Morgan Co., and will conduct a laboratory for ore testing, refining, and assaying at 227 South Main St., Los Angeles.

CHALMERS & WILLIAMS, Chicago, advise that among other contracts recently received is one for a 10-stamp cyanide plant with Burt filter and power and electric plant for the Barranca Mines (Mexico), Ltd., Torres, Sonora, Mexico; also a 15-stamp mill with power for the Mexico Consolidated M. & S. Co., Tepehuanes, Durango, Mexico.

Standardizing Electrical Mine-Equipment.

The American Mining Congress seeks to reform methods of installing electrical machinery in mines. At the Pittsburgh session, in December last year, a resolution was adopted authorizing the appointment of a committee of seven persons to report back for the consideration of means for bringing about the standardization of electrical equipment in mining and recommendations looking to uniformity in electrical practice in general. The resolution, which was introduced by David B. Rushmore, of the General Electric Co., was as follows: "Recommended, that a standing committee be appointed by the president of the American Mining Congress, to standardize as far as possible and make recommendations concerning electrical practice in mining work, said committee to consist of seven members as follows: one electrical engineer, two representatives of the manufacturers of electrical equipment, two representatives of the labor organizations, and two mine operators."

The following members were appointed by the Mining Congress to serve on this committee: Edward B. Rosa, of the Bureau of Standards, Washington, D. C., chairman; David B. Rushmore, of the General Electric Co.; W. A. Thomas, of the Westinghouse company; J. R. Bent, of the Oglesby Coal Co., Oglesby, Illinois; George R. Wood, of the Pittsburgh Coal Co., Pittsburgh; T. L. Lewis, president U. M. of A., Indianapolis, Indiana; and James O'Connell, vice-president A. F. of L., Washington, D. C. The committee will submit a preliminary report at the next session of the Mining Congress, at Goldfield, Nevada, September 27 to October 2. The absence of uniformity in the installation of electrical equipment in coal and precious metal mines has given rise to annoying problems, and the work of this committee will be watched with interest. Those having views to offer on the subject are invited to send them to Edward B. Rosa, chairman of the committee, care of the Bureau of Standards, Washington, D. C.

Coalite.

Coalite is a semi-coked coal, the manufacture of which had been introduced in England. It is the invention of Thomas Parker, a well known electrical engineer. It is a free-burning coke produced at a lower temperature than gas coke or metallurgical coke. It has very much the same characteristics as the metallurgical coke produced in earlier centuries before it was necessary to provide a hard coke capable of supporting the increased burden of a modern blast-furnace.

It has been feared that the monopoly claimed for it would be broken down by the want of novelty in the patents. On the other hand, the supporters of the process urged that though the novelty of the coke itself might be disputed, yet such coke had never before been manufactured in a by-product furnace and that the combination of the coke and the by-products made a novel and valuable process of manufacture. Experience during the last year has shown that the process as at first enunciated has required many modifications. At the present time the Coalite company is still experimenting at its plant at Wednesfield, near Birmingham. At Barking, in the East End of London, one unit of plant has been working for some months. A unit consists of 32 stills, each containing 12 tapered retorts, and its daily output is 33 tons of coalite, 250,000 cu. ft. of illuminating gas and 1000 gal. of tar. Four more units are in course of erection, and the first section of a distillery for treating the tar should be ready in a few months. Two units are being erected at Hythe, a town on the Kent coast, and gas will be supplied to the gas companies of Hythe and Folkestone, while the coalite will be disposed of locally, and the tar shipped to Barking for distillation. The most important installation in the Kingdom is probably that at Plymouth, where three units are now erected. The Plymouth gas company, to whom the gas is supplied, reports favorably on its illuminating power. At Barking it is probable that the gas will be used for power purposes. The tar is similar to ordinary gas tar or coke-oven tar. It is intended to make a specialty of a product called 'coaline,' which is practically benzine.

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TABLE OF CONTENTS.

| | |
|---|-------------------------------------|
| EDITORIAL: | Page. |
| Notes | 371 |
| Edward Henry Harriman | 372 |
| Reform in Federal Mining Law..... | 372 |
| GENERAL MINING NEWS..... | 375 |
| SPECIAL CORRESPONDENCE..... | 380 |
| CONCENTRATES | 386 |
| DISCUSSION: | |
| Prospects at Zacatecas..... | Previsor 387 |
| Slime Concentration..... | Wilbur A. Hendryx 388 |
| All Sliming..... | P. R. Whitman, Edgar A. Collins 388 |
| ARTICLES: | |
| The Southern Arizona Copper Fields..... | |
| ..... | C. F. Tolman, Jr. 390 |
| Zinc-Box White Precipitates..... | Roy F. Coolidge 394 |
| Simmer Deep and Jupiter Reduction Works..... | |
| ..... | J. E. Thomas 396 |
| Oxygen in Coal..... | 399 |
| Development of Modern Theories of Ore Deposition..... | S. F. Emmons 400 |
| American Mining Congress..... | 404 |
| DECISIONS RELATING TO MINING..... | 404 |
| DEPARTMENTS: | |
| Personal | 374 |
| Obituary | 374 |
| Market Reports | 375 |
| Commercial Paragraphs | 404 |

EDITORIAL.

FLOODS have been unusually disastrous in Colorado recently. Railway service has been seriously crippled, and it is probable the Durango smelter will have to close until tracks can be re-laid. This in turn will necessitate closing some, at least, of the mines. In the meantime Telluride gets its mail by stage, and the patient burro has again taken up the white man's burden.

LIQUIDATION of the debts of the Sierra Madre Land & Lumber Company is proceeding. The purchase of the holdings of Mr. W. C. Greene, amounting to 2,100,000 acres of pine-land, has yielded a sum which will relieve the financial tension produced by Mr. Greene's operations in the Western part of Chihuahua. The Greene Gold-Silver Company passed out some months ago, and we understand that the Greene Consolidated Gold Company has also fallen by the wayside. This is the last flicker of the Greene fire that burned so wierdly in northern Mexico, and even blinded President Diaz for a little while.

IT is with genuine regret that we chronicle the closing of Mr. Jesse Knight's smelter, which, with splendid faith in himself and the district he has done so much to develop, he built at Tintic, Utah, a year ago. The details appear elsewhere in this issue. Suffice it here to say that Mr. Knight and his friends have evidently sustained a loss of over a million dollars, and that the smelter will probably never be re-opened. Its failure illustrates anew the principle we have so often enunciated, that only on a large scale can smelting be economically conducted, and anything uneconomical is intolerable to the present age. We may lament the loss of sentiment, but this is an epoch of conservation of resources, and to produce at a high cost, when a lower one is possible, is as much a loss of national wealth as to let the forests burn up unimpeded, as they used to do in the good old wasteful days. The reason why Mr. Knight failed was that he could not feed his furnaces with his own ores, he could not contract a supply against competitors, save at a loss, and so the business went to those who could handle it most cheaply. The obvious lesson is, never start a smelter without ore enough of your own and profit enough demonstrable from the operation to give staying power while seeking to build up a clientele for custom work.

THE advance program for the Goldfield meeting of the American Mining Congress, September 27 to October 2, indicates that an unusually good meeting is in prospect. It is planned to devote the greater part of Tuesday to a general discussion of the silver question, to visit Tonopah Wednesday, to take up

problems relating to the general revision of mining laws on Thursday, and on Friday to have papers and discussions on the land policies of the Federal Government as they affect mining. Entertainment for the rest of the week has been liberally provided. While a large number of speakers have been given place on the program, the statement is made that "technical and descriptive papers will take second place to the practical discussion of live subjects upon which the action of the Congress is expected." This is exactly as it should be. The American Mining Congress is no place for the reading of technical papers. What is expected of it is discussion of the every-day problems of mining, particularly as relates to matters of public policy. It should help to formulate public opinion, and when the latter is determined should stand as its recognized exponent. This it can do by following the plan outlined. Too often public bodies of this sort suppress or misrepresent real opinion rather than the reverse. Open discussion harms no good cause, and we are glad to see the attitude the officers of the Congress have taken. The American Mining Congress has been steadily growing in dignity and power and is now, as it should be, a most influential organization. Mining men who take an intelligent interest in the larger problems of public affairs relating to their industry are supporting it, and year by year its influence increases. California will be well represented this year. Mr. W. C. Ralston, as chairman of the local committee, has arranged for a special train and a large number of members and delegates are going. The meeting bids fair to be one of the most important as well as most enjoyable of the year.

Edward Henry Harriman.

In the death of Mr. E. H. Harriman the country loses a man of phenomenal power. He stood for no academic principles of ideal manhood; he illustrated with striking force that saying of Emerson's, "nothing succeeds like success." He was one of a group of three towering figures in the economic ranks of American life. Mr. James J. Hill has been a builder of empires, a man who dared by the power of his genius to construct a great railway system across the continent, at once competing with hostile parallel systems, and having to develop the resources of a virgin country to furnish freight for his road; Mr. J. P. Morgan has shown himself an organizer superior to any who has loomed upon the financial horizon, a genius in the conception of bold designs, gifted in the delegation of authority, but one who troubled himself little about details. Mr. Harriman was a type distinct from these. He re-constructed, re-formed, augmented the work of others. He mastered detail, he directed policy. He was cognizant of the petty minutiae of management, and of the broad features of administration. His power lay in the creation of a perfect system, in producing efficiency, in daring to spend money in elaboration and betterment with such adequacy as to leave no weakness in the parts. Thus was the whole structure given harmony and strength.

Mr. Harriman has brought the East and the West closer together by his rejuvenation of the Southern

Pacific and the Union and Central Pacific systems. He may have taken all the traffic would bear, but he has given the nation vigorous arteries of communication; he has brought San Francisco within four days of New York City; he has rendered it possible to handle a tonnage over the transcontinental lines sufficient for the growth of the great West in population and affluence. He has sustained a steamship service on the Pacific which has been used as suited his plans, founded upon reasons which appeared to him economically justifiable. It will at least constitute the basis of a merchant marine which will ultimately dominate Oriental traffic. We may condemn the practices of these corporations controlled by Mr. Harriman, but we can easily believe that they were part of a process of evolution, leading along lines of practical efficiency to solid development for the future. Upon the foundation which he has laid a structure may be reared leading to greater popular good. Already it is clear that there is no Elisha upon whom the mantle of Elijah may fall. The master-builder is dead, and the power he wielded is divided among many men. Thus we see that one-man power depends upon the man. We believe in the ability of democracy to withstand the aggressions of a single individual. The modern financier has learned that greater profits accrue from increasing the individual's earning power than by reducing it. The principle of conservation applies to men as well as to forests and minerals. Hence the old doctrine of 'live and let live' acquires new force and fresh vitality.

We offer no excuses for Mr. Harriman's inflation of the indebtedness of the Chicago & Alton nor for his continuance of the iniquitous and debauching political machine created in California by C. P. Huntington. He was a modern Caesar in finance; he used any means, without scruple, to attain his ends; but he opened the way to larger prosperity. He has left a legacy of substantial progress from which the nation will benefit. Wherein his policies were anti-social they need not endure, if the people will perform their duty as citizens. There are two kinds of greed; constructive and destructive; Mr. Harriman represented the former, which is opposed to the mediaeval character of the other. He was at least modern—which is better than to be reactionary.

Reforms in Federal Mining Law.

The Federal mining law has stood without general revision since 1872. It argues well for the harmony of its parts that a legal structure should stand uncondemned by the architects for thirty-seven years. Meanwhile supplementary legislation has been enacted, and the courts have filled in the weak places with decisions giving solidity to the whole. It is questionable whether a general upheaval would not produce evil in excess of any good that might follow, but a sentiment favoring the attempt is so widespread that the matter will doubtless be given serious consideration by Congress within a year or two. The influence of the American Mining Congress in giving direction to thought and action upon this subject will be great, and the resolution which may be passed after hearing the report of the committee on revision

at the coming session in Goldfield will be watched with deep concern.

The so-called 'law of the apex', or that feature of the law conceding extralateral right, has been the chief object of ridicule and denunciation, and it is almost certain to be assailed, whether by recommendation of the committee or otherwise. It has been our opinion, consistently held, that the granting of the extralateral right was an unfortunate circumstance, because veins have a habit of departing from the simple geological prescription of the law-makers, because it is inapplicable to large masses and mineralized zones, and because of many irregularities in veins which often lead to complications too vexing to be settled amicably out of court, or so utterly insoluble as to compel compromise, which is but an escape from destruction whereby some one gets more and another less than he would be legally entitled to. The idea of a right to follow the vein on its 'dips, angles, and spurs', regardless of its wanderings beyond the confines of rigid boundaries, arose among those most theoretical of all men on earth, the plain 'practical' miners of the hills. The early Western miner theorized how a vein should be—a sort of ham-slice in a sandwich—and he insisted on having all the ham. Since it turns out that veins are not quite so simple as that, he would now return to the ways of his fathers and hem himself in by vertical bounding planes. This, however, would lead to such serious unsettling of present conditions, and would involve so many conflicts, that a change could only be succeeded by disastrous litigation, and plain common sense would incline one to leave well enough alone. It would, furthermore, involve many serious alterations in existing laws. In order to follow a vein in depth, under vertical side-line restrictions, it would become necessary to locate a much larger area, and in many cases this would require the appropriation under mining title of large tracts which at present would be adjudged agricultural land, hence not be open to location as mining claims according to present rulings, because actual discovery might not be possible by superficial exploration. It is assumed that no departure would be made from the principle which now gives to the miner the prior right in public lands, where the mineral character of the land admits of proof.

It would seem to be preferable to modify the law in detail rather than to risk the serious unsettling of conditions which would result from a general revision. There are, undoubtedly, many details which could be altered advantageously. As an example may be cited the system by which a locator may hold many claims for an indefinite period by performing annual assessment work. The purpose of the Government was plainly to compel development when a discovery had been made, but the method has failed of attaining that object. It results too often in tying up land without honest attempt at utilization. Annual assessment work should not be a means of maintaining possessory right alone; it should be a step in the process toward securing patent. The existing law requires that \$500 worth of work shall have been done on a claim before patent may issue. It has further become established by the courts that assess-

ment work is not required within the calendar year in which a claim was located. Hence it would seem reasonable to require that each year's assessment work should constitute a portion of the required \$500, and that before the end of the five-year period, which in effect may become practically a six-year period, application for patent should be made, or the claim forfeited. The object of the law should be to promote the development of industry under conditions of security, and these ends are reached through fixing a time limit within which proof of value or worthlessness shall be so completely ascertained that the possessor of inchoate rights in the claim shall either desire to perfect his title through patent, or be willing promptly to relinquish it. The law does not contemplate the granting of mining claims for the benefit of speculators whose ambition is to seek strategic positions merely for the purpose of compelling others to buy them out.

The administration of the Forest Service has accentuated other defects in the Federal mining statute. At present the Government theoretically is ignorant of the existence of mining claims, duly located and held by sufficient annual labor, until application for patent has been made, but the abuse of the right of location to acquire control of lands for the sake of timber and water-power has revealed the necessity of Governmental interference when evidence of fraud exists. On July 3 of this year the Department of the Interior decided that certain placer claims held by Mr. H. H. Yard and the North California Mining Company in Plumas county, California, were invalid. This action was taken in advance of application for patent. We objected to this proceeding at the time as being without strict warrant in law, and as representing a tendency to arrogate authority by elevating an administrative process to a rank parallel with the legislative. That such action seemed justifiable for protecting the resources on the public domain, from misappropriation, shows the need of remedial legislation.

There is a growing tendency to require demonstration of the validity of a discovery on mining claims, irrespective of application for patent. This certainly has full warrant of law. The statute says: "No location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located." Nevertheless *pedis possessio* has been fully recognized, the possession in fact by the prior prospector being protected for a reasonable time so as to give him opportunity to continue exploration which may lead to a valid discovery of mineral. This is but reading justice into the statute to make it square with the expedencies of mining. The requirement of a discovery of mineral on a lode or placer claim as a condition precedent to valid location appears unnecessary. Indications of commercial mineral may exist, or conditions may logically raise a presumption of its existence within a certain area. It would be reasonable to recognize a form of right different from that of a mining claim, a privilege to hold a certain area for a limited period subject to investigation, within which time proof of the existence of absence of a vein, or of valuable alluvial deposits, might be ascertained, upon which to base a

formal location of valid claims. This principle is successfully applied in Mexico under the name of 'zoning'. As the law in the United States is now construed by some of the higher courts, at least, a locator who may have excellent reason to believe that his exploration will demonstrate the presence of valuable deposits is only protected to the extent needed to give him room for work and to prevent probable breaches of the peace; but while *pedis possessio* is thus protected it must yield to an actual location on a valid discovery made by one who has located peaceably without fraudulent purposes. The foresight of one man may thus attract others, who may achieve a prior discovery by mere accident. It therefore becomes a 'race of diligence', in which there is also a large element of luck.

Determination of the fact of discovery opens the possibility of arbitrary interference by the Government in a manner that requires sharp legal limitation. Lodes or placers may not be valuable under certain conditions of time and place, which under later conditions may acquire commercial importance. Indications of value should take rank to no small extent in accordance with the faith which an owner of a mining property displays in the continuance of development. The 'crazy Frenchman' of Talpujahua would have been ejected if he had been required to 'prove validity', but today the world bows to the wisdom of this same Mr. J. G. Fournier, discoverer of the famous Dos Estrellas mine.

The right of locating association placer claims requires closer restriction. The principle seems faulty. There is no more reason why eight men should hold an association claim and be permitted to do the amount of assessment work applying to a one-man claim one-eighth the size, than could be adduced for an individual to hold a similar group under like conditions. An association claim usually turns out to be for the benefit of a single man; why not permit him to locate it for himself originally, and preclude his locating other claims contiguous thereto? The ends of honor and public advantage might be better gained in this way, with the further requirement of personal performance of the acts of location, than under the present system. We have seen the abuse of the law in Alaska, where sequestration of large areas has been accomplished through wholesale location of association claims, the power of attorney having been used by individuals to a degree that has strained the patience of the people and the courts.

The rights of aliens also need re-consideration. The existing law leads to an absurd anomaly. The presumption of citizenship accords the privilege of location or of holding an unpatented claim, but the alien is prohibited from obtaining patent. He should certainly be given equal rights with citizens, or none at all.

We have not ventured to review more than isolated examples of defects in the mining law, pointing out deficiencies which might properly become the subject of legislation. These could be reached without radical revision of the fundamental law. An attempt at thorough re-construction of the statute would certainly be attended by grave difficulties and financial injury to the mining industry.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

PHILIP L. FOSTER is at Mexico City.

GELASIO CAETANI is at Ishpeming, Michigan.

W. J. BARNETT was in Spain during August.

F. L. RANSOME will be in San Francisco soon.

J. C. CORBETT has gone to Ventanas, Durango.

EDWARD H. NUTTER has returned from Alaska.

LEWIS T. WRIGHT has returned to San Francisco.

JAMES DOUGLAS has returned to New York from London.

J. H. CURLE has returned to London from a holiday in Norway.

EDMUND JUESSEN was in San Francisco, on his way to Los Angeles.

C. T. GRISWOLD, of Colorado College, is in Wyoming for the Forest Service.

STUART L. RAWLINGS has returned to San Francisco from San Dimas, Mexico.

C. H. MACNUTT has taken charge of the Ponderosa mine, at Coallahuasi, Chile.

R. J. FRECHEVILLE passed through New York on his return from Pachuca to London.

H. FOSTER BAIN has returned to San Francisco from an extended trip through Colorado.

C. H. POIRIER is now at the Republican mine of the Norman Mining Co., Jacksonville, California.

R. H. BUTLER has joined C. S. HERZIG and has gone to Nicaragua, leaving London on September 9.

WILFRED B. WAINWRIGHT, of Los Angeles, has gone to Josephine county, Oregon, to examine properties.

Obituary.

CHARLES GEORGE WARNFORD-LOCK, M. I. M. M., F. G. S., was the son of a mining engineer. He was born in Hampshire, September 9, 1853. He was educated at Cranleigh, and his first professional engagement was in the sulphur mines of Iceland. He was afterward engaged in alluvial mining in Hungary, and later held responsible positions as mine manager in the Black Hills of South Dakota and in New South Wales. It was in the latter country, in 1896, that he took charge of the Wentworth Gold Fields Proprietary Co.'s mines. While he was controlling affairs there a prolonged strike took place, and it was owing to his energy and determination that he was able to run the mines during the period of disturbance, and bring the strike to a satisfactory issue. Mr. Warnford-Lock also managed mines for the Bulawayo Exploration Co. at Gwelo, Rhodesia; and for the Raub Gold Mining Syndicate in the Malay peninsula. For some time he resided in Sydney, where he practised as a consulting mining engineer. He was the author of several well known works on mining and cognate subjects, of which the chief are: 'Practical Gold Mining' (1889); 'Mining and Ore Dressing Machinery' (1890); 'Economic Mining' (1895); 'Principles and Practice of Gold Milling' (1901); and 'The Miner's Pocket Book', which ran into five editions, the last being published in 1907. In that year he also brought out his last work, 'Mining in Malaya for Gold and Tin'.

Mr. Warnford-Lock was one of the original members of the Institution of Mining & Metallurgy, and served on its council and on its various committees. He moreover contributed several papers on mining and metallurgical subjects to the Transactions of the Institution; and he always maintained a keen interest in its affairs and well-being. He returned to Malaya in 1908, where he was engaged in inspecting and reporting on properties for various mining companies. An attack of ptomaine poisoning in the autumn of last year seriously impaired his constitution, and he was compelled to take voyages to China and Ceylon to recuperate his health. These were unfortunately unavailing, for after eight weeks severe illness he died at Bandarawella, Ceylon, July 30 last.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, September 16.

| | | | |
|---------------------|------------|--------------------|-------------|
| Antimony | 12-12½c | Quicksilver (bask) | 43.50-44.50 |
| Electrolytic Copper | 15¼-16½c | Spelter | 7-7¾c |
| Pig Lead | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Copper. | Lead. | Spelter. | Silver per oz |
|----------|----------|------------|----------|---------------|
| Sept. 9. | 13.00 | 4.21 | 5.73 | 51½ |
| " 4. | 12.93 | 4.22 | 5.73 | 51½ |
| " 5. | Sunday. | No market. | | |
| " 6. | Holiday. | No market. | | |
| " 7. | 12.93 | 4.21 | 5.72 | 51½ |
| " 8. | 12.93 | 4.21 | 5.72 | 51½ |
| " 9. | 12.93 | 4.21 | 5.72 | 51½ |
| " 10. | 12.87 | 4.21 | 5.72 | 51½ |
| " 11. | 12.81 | 4.21 | 5.72 | 51½ |
| " 12. | Sunday. | No market. | | |
| " 13. | 12.81 | 4.21 | 5.72 | 51½ |
| " 14. | 12.81 | 4.21 | 5.72 | 51½ |
| " 15. | 12.81 | 4.21 | 5.73 | 51½ |
| " 16. | 12.81 | 4.21 | 5.73 | 51½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Sept. 9. | Sept. 16. |
|-------------------|----------|-----------|
| | £ s. d. | £ s. d. |
| Camp Bird | 1 8 6 | 1 9 9 |
| El Oro | 1 5 6 | 1 5 6 |
| Esperanza | 3 0 0 | 2 18 6 |
| Dolores | 1 10 0 | 1 10 0 |
| Oroville Dredging | 0 12 6 | 0 12 6 |
| Mexico Mines | 6 6 3 | 6 6 3 |
| Tomboy | 1 1 3 | 1 0 7½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

Closing Prices.

| | Sept. 9. | Sept. 16. |
|----------------------------------|----------|-----------|
| Amalgamated Copper | 80¾ | 83¼ |
| American Smelting & Refining Co. | 9¾ | 9¾ |
| Boston Copper | 14¼ | 14¾ |
| Butte Coalition | 24¾ | 25 |
| Cumberland-Kly | 7 | 7¼ |
| Dolores | 6¼ | 6 |
| El Rayo | 2¼ | 2¾ |
| Glroux | 8¾ | 9¼ |
| Greene-Cananea | 9 | 9¾ |
| Indiana Sonora | 3 | 3 |
| La Rose | 7¾ | 7¾ |
| Miami Copper | 16 | 16 |
| Nevada Consolidated | 23¾ | 24¼ |
| Newhouse | 3¼ | 27 |
| Nipissing | 10½ | 10½ |
| Ohio Copper | 4¾ | 4¾ |
| Tennessee Copper | 35¼ | 37 |
| Utah Copper | 47 | 50 |
| Yukon | 5¾ | 5¾ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

September 16.

Closing Prices.

September 16.

| | | | |
|----------------------|-----|----------------------|-----|
| Adventure | 7 | Mohawk | 62½ |
| Allouez | 60 | North Butte | 58 |
| Atlantic | 9¼ | Old Dominion | 55½ |
| Calumet & Arizona | 104 | Osceola | 148 |
| Calumet & Hecla | 675 | Parrot | 32 |
| Centennial | 42½ | Santa Fe | 2 |
| Copper Range | 81 | Shannon | 16¾ |
| Daly-West | 8 | Superior & Pittsburg | 15½ |
| Franklin | 17 | Tamarack | 74 |
| Granby | 99 | Trinity | 13 |
| Greene-Cananea, etc. | 9¼ | Utah Con | 45 |
| Isle Royale | 25 | Victoria | 34 |
| La Salle | 16¼ | Winona | 7¼ |
| Mass | 8 | Wolverine | 162 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 16.

| | | | |
|----------------------|-------|-----------------------|-------|
| Atlanta | \$ 15 | Midway | \$ 20 |
| Belmont | 80 | Montana Tonopah | 38 |
| Booth | 14 | Nevada Hills | 78 |
| Columbia Mtn | 10 | Ophir (Comstock) | 1.22 |
| Combination Fraction | 77 | Pittsburg Silver Peak | 51 |
| Daisy | 15 | Rawhide Coalition | 28 |
| Florence | 3.05 | Rawhide Queen | 25 |
| Goldfield Con | 6.85 | Round Mountain | 70 |
| Gold Keweenaw | 9 | Sandstorm | 9 |
| Great Bend | 7 | Silver Pick | 15 |
| Jim Butler | 13 | St. Ives | 9 |
| Jumbo Extension | 18 | Tonopah Extension | 60 |
| MacNamara | 32 | Tonopah of Nevada | 7.00 |
| Mayflower | 14 | West End | 31 |

General Mining News.

ARIZONA.

COCHISE COUNTY.

The mine of the Bernoudy-Turkey Creek Mining Co., in the Paradise district, has been shut down on account of the lack of funds.—The Bisbee Extension Mining Co. has stopped cross-cutting and will sink the shaft an additional 100 ft.—The Lowell shaft of the Copper Queen company has reached the 1600-ft. level, and a drift started to connect with the Sacramento.—The Superior & Pittsburg company has commenced new development work on the tenth, eleventh, and thirteenth levels of the Cole shaft. The raise from the 1500 to the 1400-ft. level of the Junction shaft has been completed, and all the water is being pumped from the 1500-ft. level.—A cross-cut from the 850-ft. level of the Oliver shaft of the Calumet & Arizona Copper Co. opened a good body of oxide ore.

GILA COUNTY.

A body of sulphide ore was cut by the adit of the Rye Copper Co., 16 miles from Payson, when in 325 ft. The adit is being run to prospect the ground under a large iron outcrop, and will require about 700 ft. additional driving to cross-cut that portion of the country. H. S. Duncan is superintendent.—It is reported that the National Mining & Exploration Co. has raised \$100,000 to carry on development work by the issue of 6% first mortgage bonds.—The New Keystone Copper Co. has installed a 3-drill compressor and started a drift on the 300-ft. level. Cross-cuts will be run from the drift on the 150-ft. level and started from the 300 when the drift there is well under way. The Keystone drills have completed 11 holes through ore assaying from 1½ to 2½% copper.—The Cole Development Co. has taken over the old Cole & Goodwin property, 12 miles southwest of Globe. There are 17 claims in the group which has been developed by a 325-ft. shaft. This opened a body of chalcopryite ore that assayed from \$3 to \$10 gold. The plan is to deepen this shaft and cross-cut to the ore.

GRAHAM COUNTY.

The Moore & Underwood lease, on the Copper Cliff claim, in the Clifton-Morenci district, has been purchased by Walter Doudna and L. T. Bridgers, who are shipping a small amount of ore.—The road from Clifton to the Gold Belt mine is being repaired, and a site for the new mill graded. The contract calls for the delivery of the mill by the first of November, and the company expects to complete the installation this winter.

MAHICOPA COUNTY.

Ten stamps are dropping in the Vulture mill, near Wick-enburg. The steam-power plant was recently replaced by a gasoline engine which has proved so satisfactory that a second one has been ordered, and ten more stamps will be started as soon as the new engine is installed.—A number of stockholders of the Golden Mining Co. visited the property at Golden recently to determine the most advantageous method of treating the ore. There is a 10-stamp mill and cyanide plant at the mine.

MOHAVE COUNTY.

The mill at the Gold Road mine will be completed in a short time, and will be started on ore from the fifth level. There is a large force of men at work in the mine blocking out ore preparatory to the starting of the mill.—L. D. Godshall has bonded the Winchester Fraction and Jubilee claims in the Wallapai district.—The adit at the Red Gap property, in the Weaver district, cut a 10-ft. vein of \$20 ore. D. S. Richards is in charge of the work.—At the Carter mine the shaft is down 190 ft. On the 200-ft. level a station will be cut and cross-cutting started toward the vein.

YAVAPAI COUNTY.

The shaft at the Leghorn mine, on Cherry creek, is to be sunk from the 485 to the 1000-ft. level as the result of the satisfactory operation of the Lane mill recently installed at the mine. A number of stockholders have visited the property lately, and it is understood that money will be

raised shortly to open the adjoining claims owned by the company.—A Nevada company has secured the group formerly operated by Richard McNary in the Copper Basin district, and will prospect several veins of cinnabar that are known to exist on the property.

CALIFORNIA.

MONO COUNTY.

A number of oil seepages in Bridgeport and Bodle canyons, five miles northwest of Mono lake, have caused considerable excitement in that neighborhood and 1280 acres of land have been located.

NEVADA COUNTY.

The drift on the eighth level of the Delhi mine, north of Columbia, opened a shoot of rich ore. The vein is 4 ft. of blue quartz, containing free gold and seams of arsenical pyrite. From the sixth level a cross-cut to the west vein opened a good grade of milling ore under the McMurray shaft giving 200 ft. of backs. Hamilton Eddie is superintendent.—A small force of men is at work in the upper levels of the Kenosha mine, but it is understood that money has been raised for development and that the company will sink to the 800-ft. level and explore the vein from that point.—A new 10-drill compressor has been installed at the Golden Gate mine.—An extension of the bond on the Native Son mine has been granted to J. H. Bishop. The adit has been driven 200 ft. toward the vein, and it is estimated that it will require 600 ft. more driving to open the ore.—The hoisting-plant at the Orleans mine has been purchased by the Dana company, and is being hauled to its property near the Idaho-Maryland mine. The shaft will be sunk to the 800-ft. level, and cross-cuts run to the vein each 100 ft. Charles B. Smith is in charge of the work.—Edward I. Field has secured a bond on the Gold Mound mine at Deadman's Flat. A shaft has been sunk 160 ft. on the property and the vein opened in several places. Mr. Field will install a compressor and sink to the 300-ft. level before cross-cutting.

PLACER COUNTY.

W. B. Pendleton is opening the old Laird mine east of Loomis.—The shaft at the Lunkens mine is down 100 ft., and is expected to cut the vein any time.—Operations have been resumed at the Star mine.—U. S. Fletcher has made a payment of \$25,000 on the Home Ticket mine, leaving a balance of \$17,000 due on the property.—The Imperial Mining Co. is putting in a new dam at its property above Auburn, and has contracted for a supply of lumber to repair the flume.—The cross-cut on the Black Oak extension, near New England mills, opened a vein of free-milling ore.

PLUMAS COUNTY.

A lower adit is being run on the Del Monte mine.—An 8-ft. vein of \$15 ore was opened by H. H. Hunter on the Owens & Carter property near Seneca.—A 30-ft. shaft has been sunk on the Hewitt claims, and drifts run 160 ft. on the vein. An interest in the claims has been sold to further develop the property.—R. A. Costar, of Prattville, has leased the Sunny Side gravel mine for a company and will drive a bedrock adit to drain the channel.—E. H. Kelley has taken 200 tons of ore for a test run from the Rose mine on Poorman's creek.—Lessees on the Crown Point group, 12 miles east of Quincy, have been milling \$55 ore.—John Taft, of Quincy, is preparing to erect a 5-stamp mill on his group on Crescent hill.

SAN BERNARDINO COUNTY.

Work has been resumed at the Jumbo mine and cross-cutting continued in the big vein. Thirty feet of ore has been opened that assays over \$30 per ton.—On the Oro Belle property the shaft is down 370 ft. A station will be cut at the 400-ft. point, and if sufficient water for milling is not found, the company will install a diamond-drill to sink for water.—The Hart Townsite Co. has uncovered an 8-ft. vein on the Red Boy claim, and is to sink a shaft to prospect the property.

SHASTA COUNTY.

G. M. Sleezer is shipping \$24 ore from the National mine, three miles north of Buckeye, to the Mammoth smelter at

Kennett. The property was formerly known as the Forbes mine, and was equipped with a mill and cyanide plant. The shoot was lost and the mine abandoned after considerable money had been spent in prospecting. Mr. Sleezer re-located the property and has lately succeeded in opening payable.—The Joshua Hendy Iron Works has attached the machinery at the Black Tom mine, at French Gulch, pending the decision in a suit for money due on machinery.—The Balaklala Copper Co. has employed J. W. Blankinslip, professor of botany, at the State University of Montana, to investigate the damage done to the orchards in the vicinity of the smelters. Mr. Blankinslip was the horticultural expert in the smoke cases at Anaconda and Butte, so is well equipped to take up the investigation of the damage done in Shasta county. Alfred Sutro, of San Francisco, addressed a meeting of the Shasta County Farmers' Protective Association at Anderson, requesting them to postpone any action until the first of November. As there was no regular list of members, no action was taken, as it was a question of who was eligible to vote.—C. M. Clark and W. W. Rees have taken a bond on the Whisky Creek group of claims, near Whiskytown. Clark & Rees have put several miners at work on the property and expect to build a small mill to test the value of the ore.—The adit at the Spread Eagle group, above Copley, cut a body of copper sulphide ore. The company is to install a compressor and drills shortly. W. C. Onn is secretary of the company.

SIERRA COUNTY.

Walter Bell has bonded the Blue Banks claim of John Reid and commenced operations.—Charles W. W. Meckin has succeeded Mr. Mather as superintendent of the Croesus, better known as the Plumbago mine.—The adit of the Slate Castle-Jaffa mine cut a rich stringer of arsenical sulphide ore.—Several loads of machinery have been hauled to the Cleveland mine, between Sierra City and Downieville. W. R. Warton is in charge of the work at the mine.—At the Brandy City gravel mine 40 men are working on the flume and dam, and a bedrock adit is being driven to drain the channel.—Hood & Breise have let a contract to haul lumber for the boarding-house at the Bunker Hill property, on which they have taken a bond.—The adit at the Gray Eagle mine, at Gold Point, opened a 6-ft. vein when in 1040 ft. The ore assays \$68 per ton, and was cut 400 ft. below the outcrop.—Lutz, McMahon & Gambrina have cut the vein in the Roasco property, three miles west of Downieville, which they are opening under bond.—The mill at the Red Star mine, near Alleghany, has been completed. There is a large amount of ore blocked out in the mine that will supply the mill for several years.—A rich lead of blue gravel has been opened in the Omega mine near Forest. Several cross-cuts have been started through the gravel. The bedrock is a soft serpentine, and the boulders are small, not over a foot in diameter.

TUOLUMNE COUNTY.

James E. Conde has secured an injunction restraining the Parlin Mining Co. from removing the machinery from the Driesam mine which it has been operating under bond.—The Yrma Mining Co., which is operating the old Josephine mine, near Algerine, under bond, is running a lot of ore from the old dumps through a Huntington mill. The ore assays \$8 per ton, and it is the intention of the company to add a 5-stamp mill to its equipment.—The ore recently opened by the cross-cut from the 400-ft. level of the Central shaft of the Soulsby mine, is averaging \$100 per ton.—In the Knights Creek district William Faller has opened a 9-ft. vein with a foot of high-grade ore on each wall.—On the Gold Bug claim a shoot of \$50 ore has been opened.—Rufus George is storing ore on the dump, preparatory to a test run.—A new vein of free-milling ore has been opened in the Excelsior mine, near Confidence, while prospecting for the old vein. James Conde is in charge of the work.—A test run of samples has been taken from the Gem mine to determine the value of its orebodies.—Newkirk & Conlee are operating the Mansfield gravel mine, on Woods creek, under bond.—R. A. Nicholls has succeeded in finding the vein at the Draper mine. The property has been a good producer in the past,

and it is reported that the vein now opened is as rich as in former days.—In the Albany mine, under bond to the Erie Mining Co., a shoot of rich ore was opened on the 700-ft. level. The vein at this point is 4 ft. wide.

YUBA COUNTY.

The committee recently appointed to investigate the action of the dredges, spent a day in the Marigold district. Next week they will spend a couple of days near Oroville with representatives from Yuba, Butte, and Sutter counties.

COLORADO.

BOULDER COUNTY.

The Primos Gold Mining Co., near Nederland, has let contracts for the construction of a 10-stamp mill. The stamps will weigh 1000 lb. each, and the pulp will be treated on Frue vaners and a canvas plant.

CLEAR CREEK COUNTY.

(Special Correspondence).—The new strike which was made in the Capital adit is proving fully up to expectations. After driving through vein matter for 20 ft., several streaks of galena have been cut that assay as high as 200 oz. silver per ton. This vein, which is supposed to be the extension of either the Colorado Central or Ocean Wave, was intersected at a depth of 2200 ft. from surface.—Conti & Co., leasing on the fourth level of the Smuggler on Brown mountain, have shot into an 8-in. streak of smelting ore, and a mill-run a few days ago was settled for on the basis of 500 oz. silver per ton.—A streak of ore 6 in. wide has just been cut in the breast of the Vesper adit on McClellan mountain. Assays are from \$60 to \$70 per ton in gold, silver, and lead. G. W. Crump is manager.—A gasoline hoist to lift timber in the raise has just been installed at the Scepter adit on Democrat mountain.—N. Anderson, leasing on the Seventy-Three mine, shipped two classes of ore last week, the first grade bringing 758 oz. silver per ton, 40% in lead, and 7% in zinc. The second-class milled 478 oz. silver per ton, 20% in lead, and 3% in zinc.—The adit being driven into Griffith mountain by L. Hoery & Co. is in 325 ft., and will cut the Tom Reynolds vein 125 ft. below the surface workings. From the upper levels ore has been taken that assayed as high as \$15,000 per ton gold and silver. Work at that point was suspended about two years ago owing to the water that had to be contended with.—E. Butts, manager of the Columbia, shipped a carload of ore last week that was settled for at \$48 gold, 22 oz. silver, with 4% copper per ton. Work has been started on the new adit which will open 400 ft. of additional stoping ground.—A strong company has been organized to develop the Hidden Treasure group of mines on Lincoln mountain, and machinery is now being delivered on the ground. This property was one of the early-day heavy producers, and is credited with having produced the richest ore ever mined in that locality.—The Conqueror M. & M. Co., operating on Covode mountain, is employing a large force of men. A heavy tonnage of ore is being mined, the majority of the product being sent to the 50-ton mill for concentration.—A rich discovery was made on the Mint property a few days ago, an 8-in. streak of ore having been cut in the breast of the adit that assays \$160 gold per ton.

Georgetown, September 14.

CHAFFEE COUNTY.

An orebody assaying several hundred ounces in silver per ton was recently cut in the May S. mine near Granite, and a shipment of 30 tons sent to the smelter. W. E. Smith is in charge of the work.

GILPIN COUNTY.

The German Gold & Uranium Mining Co. has cleaned out the old German mine on Quartz hill, and sampled the face of the drifts. The vein on the 250-ft. level is 6 in. wide, and assays over \$1000, while on the 120-ft. level it is 5 in. wide, and assays \$90 per ton. The ore is all of a smelting grade as it contains considerable silver and copper.

GUNNISON COUNTY.

At the Enterprise mine, near Dorchester, the company is installing a 300-hp. hydro-electric plant to operate the compressor being erected at the mouth of the adit. The com-

pany is also building an aerial tram to carry the ore from the mine to the mill.—J. A. Norwood shipped a trial lot of ore to the Modern smelter in Denver and has another shipment ready for the Kuenzel smelter in Buena Vista.—Harrison & Chapin, operating the Maple Leaf mine, at Sillsville, on a lease, bought the mill and surface improvements on the property.—The Raymond mine is being cleaned out so it can be sampled.—A shaft is to be sunk 100 ft. on the Morning Star property, at White Pine, and the vein cross-cut from that point. J. C. Reagan is the owner.

LAKE COUNTY.

The Ontario property in the Twin Lakes district is shipping regularly to the smelter. A recent shipment netted the company \$500 per ton.—Work is to be resumed on the Aurora ground in Iowa gulch at an early date.

OURAY COUNTY.

At the Atlas mine the work is confined to development, the mill being started at intervals to crush the ore when enough has been accumulated for a run.—The Bachlor mine has been unwatered to the second level and the company is opening a body of gray copper ore. A contract has been let for the re-building of the flume, and it is understood that the mill may be started soon.—The adit of the Old Lout mine in Poughkeepsie gulch has been cleaned out and re-timbered and the company is preparing to prospect a number of veins upon which no drifts have been run.—A picked sample from the Uncle Sam No. 2 claim ran 33% copper and 13 oz. silver per ton.—The hoist at the Legal Tender has been completed and work commenced in the shaft.

SAN JUAN COUNTY.

It is reported that the Silver Lake mine in the Silverton district is to resume operations in October on company account. There has been a small amount of work done by lessees since the company stopped work last fall.—C. P. Hall, superintendent of the Gold Queen mine near Gladstone, is authority for the statement that the company will continue operations by hand work the remainder of this year and install a complete power plant in the spring.—The mill at the Peerless San Juan is to be completed this month. The tramway from the mine to the mill has been started and a large amount of ore stored on the dump in anticipation of the starting of the plant.—The Robert Bonner mine on South Lookout mountain was sold to the Lutz Mines Co., of Pittsburg, by George H. Barnes and Mrs. G. H. Stoiber. The property has a good record for past production, and under active management should be a steady producer. G. Crossmann is in charge of the property for the new owners.

SUMMIT COUNTY.

The Wellington mill, near Breckenridge, was shut down for a couple of days to install some new machinery. A number of ore-buyers are trying to contract for the Wellington output but so far the management has not seen fit to sign for any definite amount.—The Puzzle-Ouray mill has been remodeled and is running on ore from the mine. J. Safford is in charge of the work.—The Blue River Excavating Co. is drilling its ground near Breckenridge to determine its value for dredging.

TELLER COUNTY.

The Colorado-Victor Investment Co. is installing an electric hoist and compressor on the Rigi group on Battle mountain. The company has opened ore that assays from \$25 to \$30 per ton on three levels.—Lessees on the mines of the Granite Gold Mining Co. shipped 100 cars of ore during August to the Standard mill of the United States Reduction & Refining Co., at Colorado City. The ore averaged \$30 per ton.—The Portland Gold Mining Co. has opened a rich body of shipping ore on Battle mountain.—Allen L. Burris has secured an option on the controlling interest of the stock of the St. Thomas Gold Mining Co., which owns the St. Thomas claim on Bacon hill.—G. A. Hopkins and associates have leased the Bent shaft of the Mollie Kathleen mine and are installing a compressor and hoist.—The Free Coinage Gold Mining Co. has leased the Wilson dump to A. Bergenstressor.—A New York syndi-

cate, represented by Mr. Cohen, has secured a bond and lease on the properties of the Manhattan Gold Mining Co., on Bull and Ironclad hills, and will equip them with new machinery.—A trial lot of one carload of ore was shipped from the Jefferson mine in Victor.—The Half Moon Leasing Co. has been organized to open the lower shaft of the old Half Moon property. The shaft has been re-timbered and the drift thoroughly sampled, showing a good grade of shipping ore.—A shoot of rich ore has been opened on the 1100-ft. level of the American Eagle mine and operations resumed. Paul Hines is superintendent.

IDAHO.

BONNER COUNTY.

The Swastika Mining & Milling Co. has taken over a group of 10 claims near Lakeview and will drive a 3000-ft. adit to open the ore. It is understood the company is to install a concentrating plant at Sandpoint.

IDAHO COUNTY.

A 450-ft. adit on the George group has cut ore giving 300 ft. of backs. The vein is from 5 to 8 ft. wide on the surface.—On the John Mackey claims the 300-ft. cross-cut has cut a vein a portion of which is free-milling and a portion base. The vein is 15 ft. wide and has been traced for 2000 ft. on the surface.

OWYHEE COUNTY.

Arrangements are being made to re-open the old Trook & Jennings mine on War Eagle mountain. A good body of ore has been opened on the property, but little further work done, as the title has been in dispute.—A new orebody has been opened at the Pauper property.—The Arastra mill is running on ore from the claims of Louis Sorrenson. The ore is free-milling and a good clean-up is expected.—The Silver City Mining & Milling Co. has made the connection with the wires of the power company and is now working in the adit.

SHOSHONE COUNTY.

At a meeting of the stockholders of the Nabob Mining Co. at Kellogg it was decided to increase the stock of the company from \$1,000,000 to \$1,500,000 to provide funds to carry on the work. There is a 365-ft. shaft on the property with a 125-ft. drift from the 100-ft. level which was driven on a vein that was from 1 to 4 ft. wide. A lower adit has been started that will give nearly 500 ft. of backs.—On the Best Chance property between Osborne and Kellogg an adit is in 185 ft. and is expected to cut the vein in a short distance.—A trial shipment of one ton of zinc ore was sent from the Montana Standard mine, 10 miles east of Burke, to the reduction works at Joplin. When the best method for treatment has been determined a plant will be erected at the mine.—The mill at the Hercules mine was completely destroyed by fire on Labor Day, with an estimated loss of \$100,000. The mill was idle on account of the holiday and the origin of the fire is unknown.—A 30-in. vein of gray copper ore was cut by the raise from the second level of the Mineral Point mine south of Osburn. A winze has been sunk on the ore from the first level, opening the shoot for 120 ft. The mine is a short distance from the O. R. & N. tracks and has shipped 40 cars of ore to the smelters.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—An important sale was made last week when the 45-acre lease of the Granby Mining & Smelting Co. at Oronogo was bought by H. Tonkin and associates. Members of the same company are operating the Pinnacle. A face of disseminated ore 10 to 16 ft. high has been opened in the drifts.—At the Walnut Grove west of the Pinnacle a 14-ft. face has been uncovered at 200 ft. A second shaft is to be started at once and a 300-ton mill built.—Another important sale was made this week when the Excelsior Mining Co. bought of the Leonard Realty Co. over 1000 acres scattered over the district, principally near Oronogo and Galena. The company will develop the lands and then turn them over to lessees for operation.—One of the richest pockety formations now being worked in this district is the Katherine, northwest of Joplin. An upper run has been worked at 135 ft. and drifts are now being opened

at 165 ft. The ore is galena and zinc-blende.—The McGee Mining Co. at Duenweg has been running almost continuously for two years and has produced over 2500 tons of ore. There is still enough ore in sight to run the mine two years. Up to the present time hand-jigs have been used to clean the ore, but henceforth much of it will be cleaned on rougher and cleaner jigs.—A rich body of zinc ore has been cut in Lone Elm Hollow by W. I. Rusk while drilling prospect holes.—Forty feet of rich blende and galena was cut in a drift which was being run at the 60-ft. level in the Tim McCarty shaft in Chitwood.—Myers and Boyd, in Carl Junction, opened 20 ft. of galena ore.—In various parts of the district there are many drill rigs at work and several good discoveries are reported. Four drill-holes have been completed east of the Quick Seven in the Neck City camp, three of which cut good sheet ore from 170 to 215 ft.—A 40-acre tract of the Elliot & Zimmermann lands south of Webb City is being drilled.—An important find was made in the vicinity of Reeds by the Ishpeming Mining Co. in a drill-hole. The ore was struck at 45 ft., continuing to 77 ft.—S. Y. Ramage is planning the early erection of a 300-ton plant on his lease north of Webb City. The ore under development is 29 ft. high and occurs at 150 ft. The deposit is well blocked out by drill-holes and prospect drifts.—The Gouverneur Lead & Zinc Co. has just completed a 200-ton plant at Sherwood.—Bradley & Co. will build a mill on the Connor & Phelps land at Central City.

Joplin, September 11.

MONTANA.

MISSOULA COUNTY.

The Denver & Rock Island Development Co. is to sink a double-compartment shaft on the vein of its property near De Borgia. J. L. Presnol is manager.—On the St. Lawrence group near Salt Lake a rich discovery of copper has been made. The vein is 10 ft. wide and a drift has been run along it for 1200 ft.—At the Tarbox mine a winze has been sunk 200 ft. from the face of the east drift giving a depth of 600 ft. on the vein. This is 40 ft. wide and is a good grade of galena ore. It is probable that a concentration plant will be erected shortly.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—The Coalition and Queen companies have concluded a deal for the King-Heisner mill.—The Queen Mines Co. has acquired a large interest in the plant of the National Ore Purchasing Co., and the mill will hereafter operate exclusively on ore from the Queen estate. This will enable the big property to commence production on a large scale, as it now controls excellent milling facilities.—The ore-bins at Kearns No. 2 have been completed and a steady production will commence at once.—A 5-ft. body of shipping ore is being developed on the 100-ft. level of the Gold Dollar group. A. L. Bolson is the owner.—A new hoist has been ordered for the McMann lease.—The 12-hp. gasoline hoist purchased from the Mint-Coalition Extension has been installed by the Bridges-Daniels lease.—The Lawyers lease has commenced a raise for ventilation. As soon as this is completed work on the big vein will be resumed.—The Victor Consolidated is extracting \$18 ore from the Victor and Proskey leases on Coalition and keeping the recently acquired Murray mill running at full capacity. A cyanide annex will be added in the near future. Rawhide, September 10.

An orebody 12 ft. wide has been opened in a stope on the 425-ft. level of the Combination Fraction. The ore assays \$140 per ton and extends to the 300-ft. level.—The management of the Consolidated company is preparing to open the Combination and Red Top veins as 'glory holes', and it is probable that the capacity of the mill will be doubled to handle the increased output.

LINCOLN COUNTY.

The cross-cut on the 900-ft. level of the Mendha mine opened 15 ft. of ore, 4 ft. of which assays 25% lead, 25 oz. silver, and \$20 gold per ton.—The shaft at the Prince Extension near Pioche has been stopped at a depth of 75 ft. till the company can install a hoisting plant.

NYE COUNTY.

The station has been cut at the 1500-ft. level of the Mizpah shaft of the Tonopah Mining Co., and the guides are being put in from the 1200-ft. level down. In the east drift on the 340-ft. level of the Silver Top shaft the cross-cut has been stopped when in 360 ft., as the face is in andesite.—The winze from the 1100-ft. level of the Tonopah-Belmont mine is down 116 ft. on the vein, which is 12 ft. wide at this point and of milling grade. A station will be cut here and cross-cuts driven to explore the stringers in the hanging and foot-walls.—At a report to the stockholders of the Montana-Tonopah Mining Co. it was stated that the company had completed the payments on its mill and has a cash balance in the treasury, also bullion and concentrate in transit valued at \$80,000.—At Round Mountain the Gibson lease on the Blue Jacket property opened a pocket of ore that ran \$60 per pound. On the Morgan-Stofelt-Cook lease a drift is being driven west from the shaft to tap the rich ore opened on the surface recently.—The Manhattan Thanksgiving Mining Co. is to install a sinking pump at the 350-ft. level and sink to the 500.—The new mill of the Crystal Bullfrog in the Bullfrog district effected a saving of 73% of the assay value on the plates in a trial run on 50 tons of ore from the Denver property.—The Bullfrog Mayflower Consolidated company has resumed work in the Starlight shaft, which has been idle for two years.

WHITE PINE COUNTY.

The Coppermines company has given two new leases on its holdings north of Lane City. R. H. Richardson has a lease on the Isaac mine and F. C. Williams on the Union property, each lease running a year. These mines were active producers 25 years ago.—The shaft of the Boston Ely is in ore that averages 2% copper.—At the Ely Central the company has completed a blacksmith shop and surface plant preparatory to sinking on the Clipper group.—The Cole-Ryan representatives purchased the Rickard-Ely, Veteran, Extension, Giroux Extension, and Blackfoot groups in the Ely district.

NEW MEXICO.

GRANT COUNTY.

George and Noah Hoydon have leased the Volcano mine from C. R. Smith and are preparing to ship to the Douglas smelter.—By the addition of a 375-hp. engine to the power plant of the Socorro Mines Co. the company has power for its present requirements and enough additional to run an extra unit that the management is planning to add to the mill.

LINCOLN COUNTY.

The Parsons group near Nogal has been sold to satisfy a mortgage of \$120,000, held by J. H. Fuller for cash advanced to develop the property.

OKLAHOMA.

OTTAWA COUNTY.

The Clear Creek Mining Co. has been doing some extensive development and prospecting work in Mays and Cherokee counties east of Tahlequah, and are very optimistic concerning the finding of a rich lead and zinc field in the valley of Clear creek. One shaft has cut ore at a depth of 30 ft.—The Ottawa Mining Co. will begin work at once on the McNaughton tract at Miami. It is the plan of the company to develop not only the lead and zinc of this lease, but also to prospect for oil and gas.—The Miami Amalgamated Co. has sunk a shaft upon its lease into the same run worked by the Old Chief. There are also several other shafts down; in one the ore is from 100 to 200 ft., in a second from 92 to 127, and in the third from 120 to 132 feet.

WASHINGTON.

OKANOGAN COUNTY.

(Special Correspondence).—The Owasco Gold Mining Co. is applying for a United States patent on the Cobbler, Great Wonder, Similkameen, and Ufford claims, in the Similkameen district, near Oroville.—The Number One mine, on the summit of Little Chopaca mountain, two miles west of Nighthawk, has a vein 30 ft. wide and traceable 2500 ft. The ore assays from \$2.80 to \$149 per ton in silver and

lead, with a small amount of gold and copper. The average value is said to run between \$35 and \$45 per ton. Work will soon be resumed under the management of Chas. A. Andrus, when the shaft will be sunk to the 200-ft. point, and drifts run on the 100, 150, and 200-ft. levels. An electric hoist and other equipment will be provided. New buildings are being erected, under the supervision of Chas. A. Andrus, at the California mine.—A 4-ft. vein, assaying \$26 in gold, silver, and copper, is being stripped on the Bertha and Earl group, on the east spur of Mount Chopaca, and \$10,000 has been raised to drive an adit 400 ft., which is expected to tap the vein at a depth of 1000 ft.—The machinery for the Golden Sands Mining Co.'s placers, two miles from Oroville, will consist mainly of an electrically driven pump. The company has spent several years prospecting the property to prove its value for hydraulicking.—There has been considerable development at the Arlington mine, in the Ruby camp, and about two weeks ago a 40-ft. vein was intersected, since which assays have been reported to run as high as \$105 in gold, silver, and copper. The mine is being put in shape to increase the working force at an early date. An office building and a new boarding house will be erected near the mine.

Conconnully, September 13.

SPOKANE COUNTY.

Members of the Spokane branch are making elaborate arrangements for the entertainment of the American Institute of Mining Engineers, in Spokane, September 27 to 30, when the branch of western Canada will also meet in this city. The executive committee in charge is composed of C. P. Robbins, J. C. Ralston, Henry Kehoe, and L. K. Armstrong, editor of the *Northwest Mining News*. It is expected the Eastern engineers will visit the Coeur d'Alene district on the way to Spokane. There will also be delegates from Montana, Idaho, Washington, Oregon, British Columbia, and Alberta. The mineral exhibit at the Spokane Interstate fair, September 20 to 25, will be held intact for the inspection of the visitors, and an effort will also be made to have the mining companies in the northwest co-operate with the Spokane Chamber of Commerce in making one of the finest permanent mineral exhibits in the world.

STEVENS COUNTY.

(Special Correspondence).—In Orient district the First Thought mine has resumed shipping ore, after the straightening out of some matters pertaining to transportation and treatment, which required adjusting, and 50 tons per day of ore will be shipped to the British Columbia smelter, at Greenwood, B. C. A diamond-drill has been delivered and will be operated in prospecting the mine.—In the Valley Dew mine some workings near the surface have opened a pay-shoot, which appears to increase in value with depth. An adit is in 86 ft., and a contract has been let to extend it 350 ft., which will give a vertical depth of about 300 ft. below the upper workings.—A bond has been given on the Riverside claim to John H. Arnold, a lawyer of Columbus, Ohio, for \$16,000. The payments to extend over two years. The mine is situated near Rockcut. It will be equipped this fall with a concentrator.—In the Superior Copper mine, six miles west of Chewelah, the ore-shoot struck last fall is widening as depth is obtained. The vein is now 7 ft. between walls. An adit has opened it to a depth of 100 ft., where four stringers of good ore are exposed, varying from 4 to 7 in. in width, and assaying in gold, silver, copper, and lead, and a small percentage of tungsten is reported. Silver and copper predominate. J. D. Boone is superintendent. This company may soon be in the market for machinery.

Chewelah, September 14.

CANADA.

YUKON.

(Special Correspondence).—J. H. Conrad has just bought and shipped from Vancouver, B. C., three steam boilers and three air-compressors for installation of one plant each on the Big Thing, Dale & Fleming, and Montana mines, situated in Windy Arm district, near Carcross; also a Riblet aerial tramway for the Dale & Fleming. It is stated that the Venus mill is now in operation.

Vancouver, September 14.

Special Correspondence.

LONDON.

White Lead Competitors.—Dolcoath Prosperity. — Elmore Vacuum-Plant.—Broken Hill Proprietary.

For some years there has been agitation in France against the use of white lead, and a month or so ago the Senate confirmed a resolution passed previously by the Lower House entirely prohibiting its employment. Consequently the claims of zinc white, lithopone, and other substitutes are being pressed by their sponsors. In particular, lithopone is receiving special attention, and incidentally is providing the London promoters with a new field of operation. This week the shares of a company called the Anglo French Chemical Works, Ltd., have been offered to the public. The object of the company is to acquire the works situated at Vireux in the Ardennes, France. Lithopone is practically unknown in England, although some small amounts are imported. It was originally made in Germany, though an earlier form, from which the idea sprung, was invented in England. It is now manufactured in France, and in the United States, at the Palmerton works of the New Jersey Zinc Co. Lithopone consists of zinc sulphide and barium sulphate, and is produced by the reaction between barium sulphide and zinc sulphate. The one drawback to its use is its tendency to blacken on exposure to bright light before it is dry. For this reason it is not likely to be largely used by painters, though it has applications in the enameling of furniture and other articles.

The details of the present position of Dolcoath have come to hand. The state of affairs at this mine is of unusual interest, proving once more that tin veins are worth following in depth. For some years it has been the opinion of the manager, R. Arthur Thomas, that developments at depth were placing the mine in an extremely favorable position, and warranted the sinking of a new main shaft to meet the incline shaft at about 2500 ft. In connection with the sinking of this shaft a strange event occurred. The consent of the landlord, Mr. Basset, had to be obtained before the new work could be undertaken. He consulted a firm of colliery engineers in South Wales with regard to the shaft, and he insisted on the adoption of the shaft recommended by them. Consequently there is a brick-lined circular shaft, such as is seen in collieries, passing through the hardest granite. The shaft is now down 2541 ft., and will connect with the 2640-ft. level in a few weeks. The ground in this neighborhood has turned out to be rich in many places, and ore containing 100 lb. of black tin per ton is not uncommon. It has been possible during the last half year, January to June, to increase the output of concentrate, and at the same time to reduce the amount of ore mined. In this way the manager has been able to transfer some of the labor from mining to development, without reducing the output or increasing the costs. The ore raised during the six months was 45,880 tons, which is about 4000 tons less than the half yearly average, while the concentrate sold amounted to 1000½ tons, as compared with an average of 850 to 900 tons during recent previous half years. It is not since the last half of 1901 that the half yearly output reached four figures. The produce per ton was 48.85 lb. of concentrate, as compared with from 38 to 40 lb. during the last six years. In 1895, when the mine was acquired by the present company, and additional capital for plant subscribed, the half yearly output was just over 1000 tons of concentrate from 28,000 tons of ore. This was an extraction of 79 lb. per ton. Unfortunately the tin market was in a wretched state in those days and the average price received for concentrate was only £39, so that the amount realized was only £39,769. Under the new régime, the amount of ore raised was gradually increased and at the same time the grade dropped. During the last half of 1901 the ore raised had been increased to 50,000 tons, and the content had fallen to 47 lb., so that the output was still just over 1000 tons. On the other hand, the price had risen to £70, so that the amount realized was about £70,000. Since 1901 the ore raised has

been practically constant, but the produce dropped to 40 lb. and lower. During 1906 and 1907 the boom in the price of tin brought the income to over £100,000 for the half year, and some good dividends were paid. The working profit for the first half of 1909 was £20,178, out of which £5351 went for royalties, and £1889 for income tax. A dividend at the rate of 5% per annum absorbed £8500. Other interesting items of news are that copper ore obtained from the Elmore vacuum-plant is now being sold, and that 12 heads of air-cushion stamps are to be erected in place of the old Cornish stamps still remaining as a relic of by-gone days.

The labor troubles at the Broken Hill Proprietary have had a disastrous effect on the company's financial position. The report for the six months ended May 31 shows a loss of £59,000, and £129,837 has been withdrawn from the reserve fund and placed to working capital once more. During the half year, the mine and smelter were working for only five months, and only 17,936 tons (some of it purchased ore) were smelted at Port Pirie, as compared with 132,979 tons during the previous year. The production was 438,109 oz. silver and 7609 tons of lead. Owing to the award of the Arbitration Court with regard to wages, the cost of mining has been increased, and it is doubtful whether operations can be carried on at a profit with the present low price of metals.

DENVER, COLORADO.

Dredging at Breckenridge. — Zinc at Leadville. — Floods in the San Juan. — New Orebodies. — Battle Mountain, Nevada.

Dredging at Breckenridge is now proving an abundant success after a long record of failure. There are four dredges steadily at work. Two belong to the Colorado



Mineral Districts of Colorado.

Gold Dredging Co., a Lewisohn concern, of which H. W. Loman is manager. One of these is operating on Swan creek and the other in the valley of the Blue, just at the mouth of Swan creek. Both are Bucyrus machines, and they handle from 3000 to 4000 cu. yd. per day, and work steadily as clock work. A large area of recent alluvium or re-worked glacial material is available. The pits are 40 to 45 ft. deep. The gravel rests mainly on soft black shale, but in places lies on the intruded porphyry, and occasionally on quartzite. The ground has all been thoroughly prospected with Keystone drills and its value is said to be about 20c. per yd. On French creek, above Breckenridge, two smaller dredges are at work, both doing well.

One belongs to Ben S. Revett, and the other is known as the Reiling dredge. The latter is now working just off the mouth of Nigger gulch in unusually rich dirt. The June output, \$50,000, would figure out to nearly \$1 a yard but it is not likely that the gravel as a whole is as rich. The area has not been so well prospected as on Swan creek.

Farnacombe hill, the famous locality from which wire-gold specimens have long come, is deserted except for a few lessees. The larger output now comes from the veins of mixed sulphides. The Wellington is now shipping regularly an ore which contains 45 to 58% lead; 4 to 5% zinc, 10% excess iron, 11 oz. silver, and a small amount of gold. The Sallie Barber and the Country Boy are shipping zinc, and the Pennsylvania is sending out a little lead-silver ore. The Gold Dust concentrating mill, near the railway station, is running and shipments will soon be resumed at several other properties. It is estimated that shipments of 1000 tons per month will be made before spring.

On Chalk mountain, near Robinson, Charles J. Moore is re-opening the Pearl. This mine was a good producer of silver in the 70's, but has lain idle for many years. The vein is in the Weber grits and has a micaceous sandstone hanging wall. The old workings are badly caved and present shipments are made from the dump, a silicious product worth about \$8 per ton being sorted out.

At Leadville things are looking up a bit, and the feeling that the worst is over seems to be general. No manganese ore is being shipped and the principal output is still the silver-lead carbonate. Next to this in importance is the zinc ore and then the iron. Zinc of two grades is distinguished. One contains over 40% zinc, and is sent direct to the smelters; the American Metals Co., and the United Zinc & Chemical Co., being large buyers. This ore is reduced at the Kansas plants and the cinder, carrying what gold and silver is present, is sent back to Colorado for treatment. Lower grade ore, running about 20 to 25% zinc is treated locally in the plant of the American Zinc Extraction Co., at the mouth of the Yak tunnel, a 40% product being made for shipment, or is sent to the mill of the Empire Zinc Co., at Canyon City. The American Smelting & Refining Co. also buys mixed lead-zinc ores for treatment at their Pueblo zinc smelter. Since, however, they only manufacture zinc for their own use, with a little for the galvanizing plant of the Colorado Fuel & Iron Co., they are not aggressive buyers of zinc ores. The principal shippers from Leadville now are the Iron-Silver, Ibex, Yak, Sunday, and Wolfstone. The Iron-Silver is making steady shipments from the Tucson mine, having installed a wire tram for delivery to the railway and changed the hoist from steam to electricity.

The shipment of ore from the Hahns Peak region mentioned recently in these letters, was made by the Hahns Peak Gold M. & M. Co., and came from the Royal Flush mine. The shipment consisted of 44,924 lb., and netted \$104.80 per ton. It contained 156 oz. silver and \$1.99 gold per ton. The shipment is of some importance as representing the first considerable amount of ore sent from this area since the Denver, Northwestern & Pacific railroad was built into the region. Since, however, the ore was hand-picked and represented the accumulation from two or three seasons' work, the question of quantity available is yet to be settled. The best opinion seems to be that the veins so far opened are not likely to be important producers and that the best hope for the district is in a revival of placer mining.

The floods in the San Juan have badly damaged the railways. Telluride is entirely cut off and is now getting mail by stage. It is estimated that it will be six weeks before the Rio Grande Southern is again ready to handle ore, but that communication between Silverton and Durango will be sooner established. In the meantime the Durango smelter and a number of the mines will probably have to close. The dam of the Telluride Power company went out and Telluride was at first in darkness. Connection has been made with the lines of one of the other companies and power and light are again available.

New discoveries and rumors thereof are frequent. Salida has been excited over some \$100 ore found in an old tun-

nel near town, and a mild stampede occurred there last week. There are whispers of a find near Crested Butte and the ore-shoot found in the Nightingale at Cripple Creek is being eagerly sought on neighboring ground. Alex Walker, one of the lucky Colorado men who found the rich vein near Battle Mountain in Nevada, is home and is showing specimens of ore which is certainly rich enough to satisfy the most fastidious. The vein is said to be 3 in. thick. It is a clear white quartz bound together with wire-gold and assays thousands of dollars to the ton. The mine has been sold to A. L. Mohler, vice-president and general manager of the Union Pacific, and certain Omaha associates who are preparing to open it.

SALT LAKE, UTAH.

Utah Dividend Payers.—Grand Central Wins Suit. — Tintic Smelter Closes.— Merger of Tintic Mines. — Iron Blossom Development. —Daly-Judge.

Recently a number of mining companies operating in Utah have posted monthly and quarterly dividends. These include the Silver King Coalition Mines Co., with a dividend of 15c. per share, amounting to \$175,500; Colorado, 8c. per share, totaling \$80,000; Iron Blossom, 8c., totaling \$79,200; Sioux Con., 7c., totaling \$52,457; Uncle Sam Con., 2c., totaling \$10,000. The King is the silver-lead producer of Park City, which has paid over \$12,000,000 in dividends to date, and engineers claim that the property will eclipse this record in the next 20 years. The mine is paying at the rate of about \$1,000,000 per year. In addition to four regular dividends, an extra is posted during the holiday season. The other dividend-payers in the list are Tintic producers, having good records as profit-makers. Another mine, Utah Con., of Bingham, is scheduled for payment during the month of its quarterly dividend of \$150,000.

The long pending suit between the Grand Central and Mammoth Mining companies has finally been decided in favor of the former by the State Supreme Court. The case has been before the courts for more than ten years, and was brought by the Grand Central for the purpose of recovering the value of ores taken from their ground by the Mammoth. The Mammoth claimed apex rights, but the court awarded damages of \$91,349 and interest from the time the ore was taken out of the Grand Central ground, bringing the total to \$151,030. This judgment was awarded the Grand Central, November 11, '07, and the Mammoth company immediately appealed to the United States Supreme Court. That court held that they had no jurisdiction, and the case was remanded to the Utah court for final review. The result has been anticipated as the Grand Central has won on every issue. The interest and original award to date bring the amount up to \$175,147, and as there is no further appeal from this ruling the Mammoth company will have to pay.

Jesse Knight has announced the intention of the Tintic Smelting Co. to close the plant at Silver City as soon as the ore in the bins can be used up. This plant comprises four lead and one copper furnace of a capacity of 225 tons each. It was commissioned less than a year ago, and is said to have lost over \$200,000 in that period. Mr. Knight said they found it impossible to get the ores needed to keep the plant running, and that so far as he knew they would make no attempt to re-commission the smelter. All the ores from the Knight mines will be sent to the United States furnaces at West Jordan, 13 miles below Salt Lake. Tintic and Pioche producers, which were the principal contributors, have arranged with the United States and American smelters to treat the ores now being extracted. The smelter cost upward of a million dollars, and with the losses sustained to date, it has been an expensive affair for the Knight interests, who owned all the stock. At one time they were dickering with Cole-Ryan Syndicate for the purchase of the plant. They were offered only \$500,000 and refused to sell. A few months ago they closed the plant and made alterations. It has been running a couple of weeks, when a check-up of the stock on hand showed the heavy loss being entailed. A wire was sent to Cole-Ryan to re-open the sale, but no reply was obtained, and the de-

cision to close down was announced. With these ores the United States company will place its six lead furnaces in commission, and commence running this portion of its plant at full capacity for the first time in over two years. The supply of silver-lead ore is limited, and both the valley plants are out 'hustling' in every camp within a radius of many miles for this character of ore.

Since C. E. Loose, of Tintic, and his associates obtained control of the Carisa mine a number of people have been wondering what the new owners proposed to do with this property. The Loose crowd control the Grand Central, Victoria, Sioux Con., and Carisa, and Mr. Loose is general manager of all these. Last week he made a careful inspection of the Ajax mine in the same camp, and it has since leaked out that his people propose to get control of this property. As soon as the controlling interest in the Ajax has been transferred, all the properties, with the exception of the Sioux, are to be merged in one large company, and the old producers worked on an extensive scale. The four properties have paid over \$2,000,000 in dividends to date, but none of them have paid dividends for several years. The recent deep workings in the Grand Central,



Map of Utah.

2100 ft. deep, have resulted in opening some large deposits of marketable copper ore, and it is believed that this will be found at depth in the adjoining properties. For this reason it has been decided to incorporate them in one big concern which will have one of the largest areas of mineral-bearing ground in Tintic.

At the Iron Blossom mine they have again caught up with the high-grade ore in the south drift from the north shaft. For more than a month the management has been extracting a large tonnage of low-grade ore, and this caused the company to pass its August dividend. In the north drift of the south shaft they are running a level to connect with the workings in the extreme north end of the company's territory. This working is now in a good shipping-grade of ore, and Mr. Roundy, the manager, says that he is sure they will be able to prove the existence of the first-class product for a distance of 3000 ft. In the meantime the Knight's are having deeper work done in both the Iron Blossom and the Colorado, and are getting some encouraging results. They take the view that they are certain to get secondary enrichments, such as have been found in the Mammoth, which is mining a rich ore below the 2200-ft. level.

One of the most important finds that has been made in

Park City for several years is that in the Daly-Judge property. George W. Lambourne, manager, says they have first-class ore on what is known as the great 'back vein' in that camp. At a point a few feet from the 1400-ft. level, a winze was sent down a distance of 70 ft. This went through the fissure, which is found in the limestone and found a 'blanket' vein 'frozen' to the quartzite. Mr. Mason reports from the mine that they have not gone through the deposit yet, and that a second winze 50 ft. farther on is getting into this ore. Several years ago the management tapped the ore below this fissure at a point 500 ft. from the present find. At that time a heavy flow of water was encountered, and as no rich ore was taken from the upper portion of the zone, the work was abandoned. The find has greatly stimulated the activity of the company in carrying on development. Those who have been permitted to inspect the mine are much pleased with the ore, and the opinion is that they are now coming into a large deposit. A tunnel-site, comprising 360 acres, has been bought; contracts are being let for buildings, and the power plant is almost completed. Within 60 days the work on the tunnel, that is to be sent into the mountain from the Snake creek side of the range, will be under full headway, and during the winter months this channel will be cut through into Daly-Judge territory, and this avenue will draw off water from all the workings to a depth of 1800 ft. With the completion of this work, all of the obstacles will be removed and the company should then enter upon a career of profit-making.

CHIHUAHUA, MEXICO.

Railroad Development. — Zinc Mining. — New Smelter at Naica. — Santa Eulalia.

That Chihuahua is to have a second railroad line from El Paso is now practically assured, and it is not improbable that it may be completed before the end of 1910. The Mexico Northwestern Railway Co., of F. S. Pearson and associates, which has within the last six months acquired the Chihuahua & Pacific, the Sierra Madre & Pacific, and the Rio Grande, Sierra Madre & Pacific railroads, as well as the large timber holdings of the defunct Greene company, has two locating engineering parties in the field between Nuevas Casas Grandes, the terminus of the line south from El Paso, and Madera, the centre of the timber tract and the terminus of the line north from Chihuahua. As soon as the route has been determined, construction will be pushed, as the company is anxious to get the line completed into El Paso in order to place the timber and lumber on the El Paso and southwestern Texas markets. The length of this connecting link cannot exceed 120 miles and there is reason to hope that it may be completed before the close of the coming year. As this company is closely allied with the one owning the electric street railways of Mexico City, and the hydro-electric plant at Necaxa, Puebla, which furnishes light and power to the City of Mexico, it is readily seen that there will be no lack of funds and that it may be depended on. On the branch that will run west from Miñaca, the present terminus of the Chihuahua & Pacific railroad, and which is to eventually reach the west coast of Mexico, it is not probable that any important work will be done before some time next year. It cannot be learned whether Pearson has taken any real interest in the Ed. Hartman concession for a railroad from Chihuahua to Monclova, in the State of Coahuila, though it is recognized that such a road would be an important distributor of the Mexico Northwestern's timber products into the coalfields of Coahuila, and possibly, by other connections, into the markets of southeastern Texas.

Since the adoption of the new tariff by the United States, zinc mining in and about Chihuahua has been completely paralyzed, though Leonard Worcester, Jr., who purchases for the Vogelstein interests, is quoted as stating that he is now prepared to purchase for European connections on as favorable terms as formerly given on shipments to the States. The Calera Mining Co., generally considered as having the largest zinc-sulphide deposits in the Republic, at San Isidro, in western Chihuahua, has ceased operation, largely because of the zinc market. This company, how-

ever, because of the complexity of its ores, is dependent upon a separation of the minerals. It is using the Sutton-Steele pneumatic tables for the separation of the galena from the zinc-blende, with success, but a number of additions and alterations are needed. Advantage is to be taken of this shut-down to attend to them.

Persistent rumors have been afloat for some time past to the effect that the Compañía Minera de Naica, operating the San Pedro mines of Naica, one of the largest lead producers in Chihuahua, would build its own smelting plant at Conchos, the junction point of its railroad from Naica with the main line of the Mexican Central, and now the statement is positively made that the company will spend \$1,000,000 in the erection of a 600-ton smelting plant. Its mines have enough ore to supply such a plant for 25 years, and by going into the market for custom ores could continue for a longer period. Others assert that the Naica company has no definite intention of building a smelting plant.

At Santa Eulalia, the Cocineros and Concepción have been taken over by the Inglaterra Mining Co., of New York, with a capital of \$50,000. Bainbridge Colby is at the head of the enterprise. Development will be immediately started. The aerial tram to connect the Mina Vieja of the American Smelting & Refining Co. with the town of Santa Eulalia will be completed and in operation by October 1, and a branch will be immediately started to run to the Sin Nombre mine, a mile distant.

MEXICO.

Flood Situation. — Fuel-Oil for Railroads. — La Noria, Zacatecas. — San Juan, Taviche. — San Francisco del Oro Ore-Tests — Cinco Minas.

Usually the first accounts given by the daily press of any great disaster can be discounted severely, but in the case of the terrible floods in northeastern Mexico the reverse has unfortunately been true. As news slowly filters in from the stricken district, the death-roll steadily increases, and the damage, not only to town property, but to vast tracts of rich agricultural lands along the river banks has been very great. E. N. Brown, the president of the National Railroads states that in the whole 23 years of his Mexican experience he has never seen anything approaching the damage from the recent floods. The damage to the steel plant at Monterey may affect the railroads and cause further delay as the National had just made a large contract for steel rails, and it is a problematical question as to how soon the steel plant will be able to fill the order.

The shortage of fuel-oil for the supply of the locomotives on the Mexico Central is at an end, and the coal-burning locomotives which had been fixed up and pressed into service, are again being put out of commission. The cause of the shortage is a mystery, as the Ebano oilfields are producing abundantly, and as already reported, a pipe-line is being built from Ebano to Tampico, so that oil can be piped to the Waters Pierce refinery. Also the new gas-plant that is being built for Mexico City is to be supplied with crude oil for gas-making from the same source. Oil is supplied to the railroad under contract for one peso per barrel, and as other and more profitable sales can be made, it is rumored that the company would be glad to see its contract with the Central terminate; but as the operating expenses of the Mexican Central have been greatly reduced by the use of fuel-oil, it is not to be expected that they will allow the oil magnates to slip off so easily. It would seem that dealing in oil has somewhat the same effect on human nature as dealing in horse-flesh.

The La Noria Development Co., which owns the old Noria mine, near Sombrerete in the State of Zacatecas, has been pushing development for a long time. The orebody, which was struck on June 8, has been thoroughly explored, and a mass of ore assaying two metres wide has been opened, assaying an average of 8 kg. silver per ton. It is stated that they now have upward of 60,000 tons of ore blocked in the lower levels, that will net \$10 per ton after allowing for estimated costs of mining and milling. The company intends erecting a large mill for treating the ore by concentration and cyanidation. Reports have come from

the Asientos district of Aguascalientes that good copper-silver prospects have been discovered, and quite a rush has resulted to take up claims.

The San Juan mine, at Taviche, in the State of Oaxaca, has been a good producer for the last eight years, but has been in litigation for two years, the contestants being Juan Baights and C. A. Hamilton. The right of possession was finally decided by the courts in favor of Juan Baights, who placed the property on the market with the result that Denny Bros., acting as representatives of an English company, now hold the mines under bond and G. A. Denny is making a personal examination of the mine with a view to complete the purchase. A group of important mines in the State of Zacatecas have been taken under option by George A. Wadill and associates. The mines comprise the Asturiana in the Veta Grande district, owned by the Negociación Minera Anónima Asturiana y Anexas, the Los Compos mines, and the Carmen reduction plant, adjoining the Los Compos, making a total of over 100 pertenencias. Mr. Wadill has recently been at the properties in company with Victor M. Braschi and C. F. Rhodes, who were acting in an advisory capacity. The option granted by the owners allows a period of eight months in which to un-water, examine, and sample the mines. It is announced that the work will begin without delay.

At Parral, in Chihuahua, a large force is working on the new mill of the Parral Consolidated Mining Co. The San Francisco del Oro mines at Parral are making a shipment of 500 tons of ore to Wales, England, for the purpose of making a thorough series of working tests, with a view to finding a solution for the treatment of the rebellious ores of this mine, of which a large body is blocked out. A. H. Kennedy, a well known contractor and millwright, was at Parral recently on his way to erect a 100-ton cyanide plant. Nearly \$20,000 worth of machinery for the development of the Cinco Minas has been shipped into the mine, at Hostipaquillo, State of Jalisco. The machinery includes an air-compressor plant, drills, pumps, and electric motors, it will be erected as soon as possible, and then development can be rapidly pushed. The Mina Grande, in the same district, which was recently purchased by Luis Chevrillon, was taken over in the interests of Francisco J. Tournier, the well known and wealthy French engineer, who is the principal shareholder in the Dos Estrellas mines in the Tlalpujaha district of Michoacan. A company has been organized with a capital of \$300,000 to develop the mines and Mr. Fournier has taken a large block of the stock. The fact that Mr. Fournier is behind this means much for the district. Three of the adjoining properties have also been bought in by the same interests. Operations will be in charge of Mr. Hoeling.

BRITISH COLUMBIA.

Le Roi Increasing Work. — Phoenix District. — B. C. Copper Shipments. — Granby. — Tip Top Bonded. — Zinc at Arrow Lake. — Lucky Jim.

The working force at the Le Roi mine has been increased to about 80 men, and in addition to the three diamond-drills, a few machine-drills have been put into commission. A body of good ore has been opened up on the 700-ft. level, and some stoping is being done on the 600-ft. The development of the lower levels of the Le Roi will be energetically extended from this time forth, and all of those interested are sanguine that good results will ensue. The Consolidated group and the Le Roi No. 2, Ltd., made the usual shipments for the week, making the total tonnage shipped from the camp for the week ending September 4, 4370 tons of ore. The smaller properties about this camp are not as active just now as formerly. Work has been stopped at the Evening Star, owing to legal difficulties with one of the lessees. At the Hattie Brown but little development is going on at present, but the management states that some diamond-drill work is about to be undertaken. In Blue Bird affairs there has been a lull, while the company, which has just bought out the lessees, draws up its plans of operation and work. The outlook for the camp, however, is better than for some time. The main reason why some of the more meritorious smaller properties are not

working is the owners will not lease to men who have no capital with which to work properly. There are many applicants, but they have not got the money necessary for the systematic working of the Rossland low-grade mines. The Phoenix district received a visit from J. A. Lewishon, director, and J. Parke Channing, consulting engineer, of the New Dominion Copper Co. during the past week. In company with J. E. McAllister, manager for the B. C. Copper Co., and J. Seward, manager of the Dominion property, they visited the Brooklyn and Rawhide (Dominion) mines at Phoenix; the Mother Lode (B. C. Copper) at Greenwood, and the Sunset and Idaho (Dominion). It is generally understood that Mr. Lewishon is deeply interested in both the B. C. Copper and Dominion Copper companies. The B. C. Copper Co. is making regular shipments of nearly 8000 tons per week and the activity of the company is felt all through the district. The company has a small force of men working on the Sappho group, near Midway. They have also applied for a water-right in the Similkameen water district, to be used in connection with the Wellington mines. It is said that the directors of this company have planned to declare dividends when the surplus shall have reached the sum of \$200,000. The B. C. Copper Co. has been negotiating for the last few days toward the acquirement of a group of claims near Kamloops, on which there is a promising showing of iron ore. The 'glory hole' work at the Mother Lode mine is to be carried on more extensively in the future. This class of work cuts down the working costs, and enables Boundary mines to produce $8\frac{1}{2}$ c. copper. Work is soon to begin on the Canadian Pacific railway spur to the Phoenix Amalgamated group. As soon as this is completed the Consolidated M. & S. Co., of Canada, will begin ore-shipments from the property to its Trill smelter. This concern will also ship from the No. 7 mine in Central camp as soon as the proposed spur is finished. There are now 14 men on development at the No. 7. It may be necessary and economical to build a concentrator to reduce the ore from the No. 7 mine. The general manager for the Granby Con. M. S. & P. Co., A. B. W. Hodges, left during the past week for a trip of inspection to the Queen Charlotte islands. R. P. Williams, a local mining man, accompanied Mr. Hodges, being associated with him in the Contact group, at Tasso harbor. The Granby company will soon finish the work of enlarging its eight furnaces and will be in a good position to reap the benefit of the expected rise in the price of copper. Recent improvements have cost the Granby about \$250,000. In addition to enlarging the furnaces, the blowing-plant has been augmented, also the converter-plant and one or two of the old wooden buildings have been replaced by steel structures. It is thought that under the improved working conditions the Granby can place blister copper in New York at $8\frac{1}{2}$ c. per lb. This concern has already paid \$5,000,000 in dividends on an issued capitalization of \$13,000,000. It is now eight months since the company paid its last dividend. Among the large shareholders are J. J. Hill, First National Bank, of New York, American Metal, Nichols Copper, and H. L. Higginson, of New York. The Tip Top and Bay mines are reported as bonded to W. H. Sherrod, of Seattle, and associates. The California and Alpha, in Wellington camp, are under consideration by the same people. The Riverside claim has been bonded to John H. Arnold, of Columbus, Ohio, for a figure close to \$16,000. It is stipulated in the bond that a concentrating plant must be erected within four months; the payments to extend over two years. Some 90 tons of good ore have already been shipped from this claim as a sample.

At Nelson the Big Ledge zinc property on the Arrow lakes, has been taken on option by W. J. Greenstreet, of the Guggenheims. The Big Ledge has a prodigious showing of black-jack, assaying as high as 40% zinc. Very little development work has been done, but it is said the price of the option was near \$400,000. The Lucky Jim mine is making occasional shipments of zinc-blende, assaying approximately 52% of the metal. There is also about 16,000 tons of concentrating ore knocked down in the mine, and it is said that plans are under way for the erection of a concentrating plant.

FAIRBANKS, ALASKA.

Bonnefield District.—Rich Veins.—Duration of Placer Mining.—Gold Stream.—Hot Springs District.—Koyukuk.

The Bonnefield district, 80 miles south of Fairbanks, is attracting prospectors, and many locations have been made of placer and lode claims. Clarence Berry and James H. Hamil and their associates have taken up claims in that district including creek-beds and bench-grounds. The locality is not far from the Government road that is being constructed between Valdez and Fairbanks, and is situated in the northern foothills of the Alaskan range of mountains. One of the most promising prospects is the Jerome lode, in control of The McConnell, Chute & Crawford Mining Co., of Fairbanks. This lode is 250 ft. wide, intersected by Chute creek, whereby the formation is exposed. The lode is composed of mineralized quartz and porphyry, and is enclosed by schist and porphyry; but has a thin limestone capping. An average of 100 assays is said to have shown \$18 per ton in gold. An Allis-Chalmers prospecting mill was hauled in and erected on the property this season and operated 37 days on the Jerome lode ore, crushing 1000 lb. in 10 hr., from which was recovered \$5 per ton by amalgamation, and a high-grade concentrate.

Other lode prospects are being developed nearer Fairbanks. Among these is the Pioneer group on Chatham creek, a tributary of Cleary, where Bob Fleming, in 1906, dug a prospect hole to bedrock and took out \$103,000. In doing this work plenty of quartz was uncovered, and in 1908 W. S. Reese, T. L. Thurston, R. R. Myers, and R. C. Erchinger, who had made quartz locations, began work and opened a well defined vein $3\frac{1}{2}$ ft. wide, containing gold-bearing ore, samples of which assayed \$50 per ton according to large tests made in the Brumbach, Hamilton & Kellogg mill at Fairbanks. A 75-ft. shaft has been sunk, and a 500-ft. tunnel driven. Money is being raised for work on a larger scale next season. An extension of this lode, called the Jupiter, is owned by John Dahl, W. Larson, James Wickersham, Jas. W. Hill, J. L. Sale, L. S. Robe, T. L. Thurston, and others. Enough work has been done to show an 8-ft. vein with ore assaying \$20 per ton. The Free-Gold lode, on Bedrock creek, a tributary of Cleary, six miles from Chatanika, has a 50-ft. shaft, and a 70-ft. drift on the vein from 1 to $2\frac{1}{2}$ ft. wide. This belongs to W. C. Hall and L. B. Rhoads.

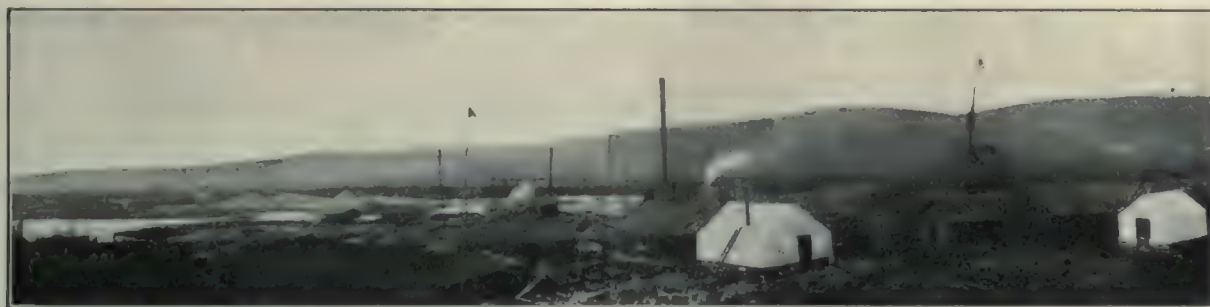
On the creeks north and northwest of Fairbanks there are 104 plants in operation on placer-ground; a plant usually consists of steam-thawing and steam-hoisting equipment, and a pumping station for delivering water to the sluices and for keeping the bedrock workings clear of water. Besides there are a good number of properties working by windlass. The force of men engaged on all these properties is estimated at 2500 to 3000. Operations have been handicapped by a shortage of water, though heavy July rains perceptibly replenished the supply in the reservoirs and ditches. While bedrock driving, hoisting, and sluicing will continue for years, the consensus of opinion is that the richer channels are pretty well worked out, and this season will practically finish the ground embodied in many of the leases, or 'lays' on Goldstream, Dome, Esther, and Cleary creeks. There are some lessees, however, having grounds that will last through one or two more seasons. Some of the creeks more recently opened are just now at the zenith of their production, but they are comparatively small in area. In general the mica-schist bedrock and auriferous stratum of gravel overlying it are from 60 to 200 ft. below the surface on the streams in this district. On Goldstream the bedrock shafts are from 60 to 125 ft. deep, while those on Dome creek reach a depth of 150 to 200. Below are given some data which may be considered typical of the operations in the district. The 83-acre tract at No. 17 Goldstream belongs to L. L. James & Co., of California. It is being operated by the Union Mining Co., composed of George La Montagne, Joseph and Mike Susang, and John Kucel, who began as lessees in 1908 and expect to continue till the bedrock area is worked out. In this case the depth to bedrock is 60 ft., and they are operating through three shafts, using the trolley-lift and steam-hoist for delivering the pay-dirt to the hopper that

opens into the sluice-way. In driving and hoisting they take up 4 ft. of bedrock and 4 ft. of the gravel lying next to it. An area 1400 ft. long and 500 ft. wide has been prospected and blocked out, and on this the production progresses, handling 700 sq. ft. of bedrock per day, the value of which is estimated at \$3.25 per square foot. With a force of 65 to 75 men they hoist 700 buckets of pay-dirt per day, there being five wheelbarrow loads to each bucket. A clean-up is made every Wednesday. One clean-up which I saw yielded about \$12,000; the one made the previous week exceeded \$20,000. Mr. James constantly supervises the operations, and has one or two more prosperous seasons ahead. Adjoining the grounds of the Union M. Co. is the lease of Jorgensen & Nelson, also from Mr. James. These men operate through one shaft and make clean-ups that indicate that they are in ground of the same value as that of the Union. No. 14 Goldstream, second and third tiers, belongs to Chas. Knell, and is leased to Maddock, Monkman, Kellett & Brown, whose term expires this season. In the depth of 113 ft. from surface to bedrock they sank through 94 to 96 ft. of muck and 18 ft. of gravel. While they have three plants for thawing and hoisting, only one is in operation this season, as they have not had sufficient water for sluicing. Large dumps of pay-dirt have been hoisted, which will be sluiced after the lease expires. It is claimed that this dirt contains gold to the value of \$1.50 to \$1.75 per square foot. Quarley & Ness are operating on Vogelín & Aubert ground, Goldstream, and have done driving from four shafts,

for another season. Their method is to block out the ground in squares of 200 ft., then thaw and drift. The general average of the value of the material is \$1.75 per sq. ft. of bedrock. Ed. Thomas & Co. operate the Blue Bird fraction, and some adjoining ground. They have two shafts and a good deal of ground blocked. Besides, they have been sluicing their winter dump, the largest in the Tanana valley. The gross clean-up from this dump was \$140,000. It came from 65,000 sq. ft. of bedrock. Work will progress here this winter in driving on the bedrock, hoisting it to the dump for sluicing in 1910.

George Friend, an owner of ground at No. 4 Below, on Dome creek, has had a good season's work. His partner is Frank Lawson. It is claimed their work has almost reached the finish. The winter work on all these creeks, consisting of thawing the bedrock stratum, and hoisting the pay-dirt to the dump for summer sluicing, is important, because then it can be washed rapidly at a time when water is most plentiful. In these notes there is no attempt to fully cover the field, but the operations and conditions herein outlined are typical of what would be found on Esther, Cleary, Engineer, and Chatanika creeks.

The question of operating dredges in this district has not received much attention. The great depth of the pay-strata is a serious obstacle. It is believed that there are benches, however, that might be considered dredgeable. The Hot Springs district has been active, excepting that there was a period in mid-summer when the water-supply gave out.



Mining at Fairbanks, Alaska.

and are handling a good yardage of gravel.

M. A. Mahoney and Chas. McDonald have put in their first season of a three years lease on one claim of the Vogelín & Aubert ground, at No. 16 Goldstream. They have three shafts and are driving from two of them. They are lifting 2300 wheelbarrow loads of gravel per day, taking it to a depth of 8 ft., the value of which is said to be \$3 per sq. ft. of bedrock. There is no shortage of water here, and a steam scraper is used for moving the gravel from the dump into the sluices. The sluicing season will close about October 8. Dave Yarnell has done well on Dome creek, where he has nearly worked out the ground on No. 1, and the upper half of No. 2 Below. He has operated from four shafts, and is sluicing a large dump on the lower half of No. 1. The depth to bedrock here is 150 ft., the barren overburden being 80 ft. thick. The principal pay comes from the lower 7 ft. of the gravel and a foot or two of the mica-schist bedrock. This group is well up the creek, and from here down-stream to the Chatanika is a string of hoisting, thawing, and pumping plants for a distance of eight miles. Much of the ground here belongs to Cook & Co., and Barnette & Co., of Fairbanks, all of which has been and is now operated under lease. Riley & Atwell are working half a claim, with two shafts, but will finish this season. Their pay-channel extended along the course of the creek, and had a width of 150 to 230 feet. It was opened by shafts 150 to 160 ft. deep. King & Manson, lessees of the upper end of No. 5 Below, have mined the pay-channel 400 ft. long, and 150 ft. wide, through one shaft. The pay-dirt was 3 ft. thick, and yielded \$2 per sq. ft. of bedrock. They finish up their leased ground this season. C. J. Robinson and associates own and operate the third tier, No. 6 Below, Dome creek, having two 210-ft. shafts. The pay-stratum is 4½ ft. deep, and was 200 ft. wide and 1102 ft. long. They have operated two seasons, and have unworked ground enough

This was partly overcome by heavy rains in the later days of July.

Fairbanks is a homelike place as well as an important supply-centre for a great area which is being prospected. By this time next year the Government wagon-road from Valdez to Fairbanks will be finished, and this will permit of wagon and automobile travel between those two points in summer; the travel in sleds, drawn by horses, is extensive now during the winter season.

The Innoko river, which joins the Yukon near Holy Cross Mission, rises in the Alaskan range, close to the headwaters of the Koskukwim, and has been much explored this season. The principal placer-mining points on the Innoko are Gaines, Little, Ophir, and Yankee creeks, which come into the main stream from 500 to 525 miles above its mouth. The trading places are Tihkakak, Gierder, and Simel. The output of the Innoko this season is estimated at \$270,000.

A. Pelky and F. G. Kimball have come out of the Innoko after a stay of three years on Gaines and other creeks. They brought gold nuggets of the value of \$1200; one nugget weighed over 25 ounces. They report that the greatest hindrance to operating on the Innoko is the scarcity and high price of food and mining supplies. Operations on the Koyukuk are at Bettles, which is at the head of navigation, and at Coldfoot, 75 miles up-stream from Bettles. The most productive camp is at Nolan, or Wiseman, 18 miles above Coldfoot. It is reported by a resident of that country that the 1909 output of placer-gold will amount to \$500,000. The best workings are on Nolan creek, where the discovery was made in May, 1908. Among the operators are Johnson & James, on No. 5; Murray & Nolan, on No. 2; Nolan & Calhoun, on No. 4; Olson & Anderson on same creek. Work closes for the season about September 15. Provisions are reported to be available in plentiful supply at Bettles, and freight rates were reduced some this year.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Copperas is obtained almost wholly as a by-product in acid-cleaning of iron and steel sheet and wire. Thus the bulk of the output comes from the United States Steel Corporation. The amount produced in 1908 was 35,334 tons, worth \$388,674.

Angle of slope at which walking, as distinguished from climbing, on hill sides ceases to be possible is about 38 degrees from the horizontal, or a rise of 1 ft. in 1.61 horizontal. On a slope of 1 in 1 (45°) it is quite impossible to move without the aid of the hands.

Application for patent does not relieve the owner of a claim from the necessity of doing assessment work within the same year, unless the proceedings advance to the point where the money required is paid over to the local Land Office within said calendar year. It takes a number of months to secure patent, even when no opposition is made, and it is unsafe to rely upon exemption from assessment work being acquired in that manner.

Vanadium ores are sold on the basis of the contained vanadic oxide. The lowest quantity which will be accepted is 15% V_2O_5 . The price is approximately 50c. per pound of the V_2O_5 in the ore. Vanadium ores are usually capable of concentration, though with some varieties the slime-losses are heavy. The principal ore is vanadinite, a chloro-vanadate of lead, having 19.4% V_2O_5 when pure. Its specific gravity is 6.66 to 7.23; hardness 3; resinous lustre; white to pale yellow streak; opaque to translucent; and deep red, yellow, or brown in color.

Chromite requires fusion with certain mixtures to render the chromium soluble. A good method is fusion with 10 parts of bisulphate of potash, or with a mixture of 5 parts each of bisulphate of potash and potassium fluoride, or with 5 parts of hydric potassic fluoride alone. The fused mixture is soluble in acids. The fusion is made in a platinum crucible and requires a high temperature and prolonged heating. Undecomposed particles require re-fusion. Fusion with 5 parts of caustic soda and 3 of magnesia converts the chromium into salts soluble in water; and fusion with 12 parts of caustic soda will yield the same result.

Strength required for neat cement, according to the standards of the American Society for Testing Materials, is as follows:

| | Lb. per sq in. |
|---|----------------|
| 24 hr. in moist air..... | 50 to 100 |
| 7 days (1 day in moist air, 6 days in water)... | 100 to 200 |
| 28 days (1 day in moist air, 27 days in water) .. | 200 to 300 |

These are minimum strengths. It is apt to be the case that a cement which develops an excessive strength within 28 days will not hold its own as well as a brand which shows a more gradual increase. The best cements show a strength of about 600 lb. per square inch in 28 days.

Check-drilling of a placer-property need not be as close as the original drill-sampling if the purpose be merely to establish the probability of error. The sufficiency of drilling only a few holes over a previously tested area would depend entirely upon the object in view, and the reputation of the original sampler. If the intent be to check the work as a preliminary to purchase it is usual to thoroughly re-sample the ground, notwithstanding the reputation of the first sampler. A few drill-holes judiciously placed over an area which had been well-tested would be enough to prove the probable accuracy or error of the work.

Assaying antimonial gold ores is best done in a crucible, using a small amount of nitre for oxidizing the sulphide. Some assayers regard it as important to estimate the amount of nitre needed for complete oxidation in order to insure the best results. The assay charge should contain a considerable proportion of borax. A method used by C. O. Bannister consists in charging the ore with sufficient nitre to render oxidation complete, into a hot crucible, a little at a time, and before it melts, to scrape it out into an iron mortar and mix with red lead, charcoal, and fluxes. This procedure eliminates to a considerable extent the need of cleaning the slags when assaying low-grade ores. The slags, however, should always be tested, and may require re-treating.

Pitchblende is in steady demand, as a material for the preparation of radium chloride and bromide. It is a black granular mineral, sometimes botryoidal, and resembling pitch, though sometimes blotched with brownish or yellowish spots. Its specific gravity is 5 to 9.7, and its hardness 5.5; streak on porcelain gray, olive-green and dark brown; exceedingly brittle. The most characteristic test is with the borax bead, which is green, becoming enamel-black on flaming. It is soluble in nitric acid to a yellow solution, from which a bright yellow precipitate is thrown down with ammonia. As pitchblende (uraninite) is a uranate of uranyl and lead, with other metals, it generally yields reactions for lead. It occurs in granitic rocks, and in metallic veins, often with sulphides of silver, lead, cobalt, nickel, iron, zinc, and copper.

Suction gas-producers are those in which the air and steam are drawn through the fuel-bed by means of the exhausting action of the gas-engine piston. These producers may have the vaporizer connected therewith as an integral part of it, or it may be separate, or even heated by the engine exhaust. The regulation of the steam delivered into the producer is of great importance, especially where the load on the engine is variable, otherwise the quality of the gas will vary, or the fire in the producer will be extinguished. The possibility of automatically controlling this is one of the chief advantages of the suction type. Pressure-producers do not yield a gas of uniform composition, and this occasions difficulty in exploding in the engine-cylinder. The leading models of suction-producers are the Nagel, Otto, Fairbanks-Morse, Pintsch, American, Crossley, Smith, Baltimore, and Wyer.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Prospects at Zacatecas.

The Editor:

Sir—Zacatecas is one of Mexico's most noted 'antiguas', the mines having been discovered about 1540, and the production since being exceeded in value only by that of Guanajuato, but whereas the latter is almost entirely a silver-producing camp, the Zacatecas ores contain often a notable proportion of gold, and yet there are comparatively few new enterprises on foot. Meanwhile at Guanajuato a veritable boom has developed during the past five years. Probably the proximity of the latter to the City of Mexico has something to do with it. Mexican civilization patterns largely after that of Europe



Zacatecas, Mexico.

in this respect, that the rich steadily gravitate to the national capital, which also becomes thereby the commercial capital, leaving their properties (mines or ranches), that have made them wealthy, in the hands of local agents. If these properties be mines, they are generally ruined in the course of a few decades. This is the history of nearly all the great bonanzas of Mexico. Consequently foreign investors and promoters, looking for properties, come to the capital first to become acquainted with the owners, and are more readily attracted by districts nearby than by those at a greater distance. Hence the revival of Pachuca, Taviche, Guanajuato, Taxco, and numerous other districts in the southern States of the Republic.

It is safe to say that if Zacatecas were in any one of the Western States of the American Union, where the national mining law is in force, there would be at least five hundred new shafts going down in its hills, and a thousand prospectors digging holes over its surface, but being where it is, and under conditions which do not recognize the prospector as a part of the game, the case is different. Only one new shaft is sinking in the district, and not a single prospector is in evidence. Thus the main glory of

Zacatecas today is in its past. With payable ore at a score of places already well known, with the finest of climates all the year round, with abundance of cheap, good labor, direct railroad connection with the rest of the world, and all the modern conveniences that the latter brings in its train, 'old Zac' is still a dull, slow place, haunted perhaps by the spirits of the thousands of aborigines who were worked in the mines as slaves till they died, in the days of the Spanish conquerors, and probably also by the ghosts of the slave-drivers themselves.

How to change this, and get the brisk and optimistic American mining operator into the field, is the problem that is agitating its citizens, and the owners of its idle mines, most of whom reside in the City of Mexico, distant less than 450 miles, or 16 hours of travel-time. There is no use for the real prospector to come here with the idea of locating some of the good ground that is open for denouncement, for he has not the money to maintain his title while a buyer is being found. And the prospector who has money is not the kind to wander around on the hills with a

pick and shovel, and dig holes on promising outcrops. It will avail nothing to re-tell the marvelous history of the district. That has been done already a score of times, until the additions and embellishments, that invariably collect like barnacles around the story, are bigger than the facts themselves. The yarn thus becomes so imposing as to alarm even a tenderfoot. Nothing is to be gained by stating the details of work in progress, for there have been but two new operators within the past four years. The 'old stagers', like the Bote, Australia, Magistral, Zaragoza, Fortuna, that have been steadily in

operation for a dozen years or more, are doing nicely as usual, and expect to continue. It remains only to write generally, and trust that Providence will cause the screed to come under the eyes of some of those who are looking for a really good thing in the way of a mining proposition. For such, the locality and the conditions are exceptionally attractive. The altitude is 8500 ft. resulting, in this latitude (about 23 degrees north), in a climate that is never hot and never cold. The town is clean and healthy, with about 20,000 inhabitants, directly on the main line of the railroad, well-lighted with electricity, supplied with a good hotel, and the mines are so close by that many are even within the city limits. All are within a radius of six miles. Good wagon roads and bridle paths are everywhere. There is an abundance of cheap labor, good for its class; excellent stocks of merchandise in the stores; unusually good meat, vegetable, and fruit markets, and a government military post, so that life and property rights are amply protected.

As for the mines, there is abundance of low-grade silicious ore, carrying both precious metals, well adapted for the cyanide process; also medium and high-grade sulphides of iron, copper, lead, and zinc,

some of which may be cheaply hand-dressed to a marketable product, while the balance is readily amenable to concentration. There is a sampling works in town, where mineral can be turned into cash in three or four days. At only a few of the mines, and in but one part of the district, has there been any serious trouble with water, though a number are down to the 1000-ft. level, and even there it is child's play compared, for instance, with such districts as Leadville or Virginia City. The lodes are large, well mineralized, and give evidence of great permanence in depth. But an insignificant fraction of their length has been explored, only, in fact, where rich mineral cropped out at the surface, and forcibly drew the attention of the early explorers.

The rich ore occurs in *clavos* or lenses, most of which have been of comparatively small size (50 to 100 ft. long and about the same high), and two to six feet in thickness, but many have been found of much greater dimensions, that have yielded millions. They follow each other in shoots or 'flocks' between the walls of the veins, and are generally connected by stringers or leaders. Occasionally there is faulting, but rarely to the extent of more than a few feet. The lower grade and concentratable material generally occurs as the envelope of these rich *clavos*. Most of the precious metal is with the iron sulphide, though the lead and copper sulphide is also payable. The zinc sulphide is usually poor in gold and silver. There is quite a little zinc carbonate and silicate in certain parts of the district. To sum up, this is a good place to come to if one is looking for an opening in mining, free from most of the inconveniences and discomforts that are usually met with in mining districts.

PREVISOR.

Zacatecas, Mexico, September 2.

Slime Concentration.

The Editor:

Sir—In your issue of August 7 I note an article on slime concentration. If your correspondent 'C', or in fact any other interested person, will come to Denver he will be shown a simple device which, in the opinion of many eminent metallurgical authorities, has satisfactorily solved the vexed question of slime-recovery. Henry E. Wood, of Denver, has in operation on a small scale as well as on a commercial basis, an apparatus which on a wide range of sulphide ores has made an average recovery of 80 to 90%, and frequently higher. Over 300 trial tests of different ores have been made, and the extraction in most cases has reached the above figures. After removing the slime the remainder of the ore passes in a classified condition to either tables or jigs of standard type. By this combination plan practically all use for vanners or slime-tables is done away with. The process is simple, requiring no extra power, and the cost of additional equipment is slight. A vacuum is not used. A minimum amount of water is required, and specific gravity enters only into the final separation of the coarsest particles of mineral and gangue. Full details on this very interesting subject will be shortly published. In the meantime, Mr. Wood is testing difficult ores sent to him. The method has been highly endorsed as practical by R. H. Richards,

of Boston, A. R. Wilfley, inventor of the Wilfley table, and many prominent mining men, engineers and metallurgists generally. It works as well on 4 to 6 mesh as on 40 mesh and finer, recovering nearly all the sulphides in the slime that are liberated at the same mesh at which the ore is ground.

WILBUR A. HENDRYX.

Denver, Colorado, August 24.

All Sliming.

The Editor:

Sir—I wish to express my appreciation of E. M. Hamilton's article on 'All-Sliming', in the MINING AND SCIENTIFIC PRESS of August 21. It would seem impossible to state the conditions obtaining in this important metallurgical method more fairly or more concisely. Few metallurgists have escaped the trials incident to some of the so-called slime-plants. I recently left, without regret, a plant in which they were attempting to agitate with paddles, pump through 4-in. pipes, and eventually cake on a suction-filter, a product of which over 20% was coarser than No. 150 mesh. In another plant of unhappy memory, while only 10 to 15% of the product was coarser than No. 200, the material was of such a nature that if an agitator stopped for 10 minutes, it never started again until dug out. In respect to many such plants, it is certainly easy to agree with Mr. Hamilton that a separation of the two products, with the normal treatment demanded by each, would yield equally good results metallurgically, with less wear and tear, and more peace of mind.

Mr. Hamilton's ideas on the collection of slime-free fine-sand are of great interest. At Flores, Guanajuato, some years ago, we noticed that the charge in our sand-collector, fed by a Butters distributor, with the usual arrangement of pipes, naturally rose faster in the middle than at the periphery of the tank. The slime had an apparent tendency to settle and slide toward the sides of the collector, often making a product that gave trouble both on the belt and in the treatment-vat. I had never seen a distributor arranged to discharge only at the sides of a vat, but it occurred to me that by so doing it might be possible to obtain a peripheral ring of clean sand leaving the slime, some of which would unavoidably settle to contaminate a more restricted area in the centre. Although we were settling in water, and continued to use our peripheral overflow, this proved to be the case, and we had less trouble with our sand in the future. In the new plant of the Virginia & Mexico Mine & Smelter Corporation, recently started at Hostotipaquillo, Jalisco, I urged a similar arrangement of the distributor, and a central weir overflow. The advantages described by Mr. Hamilton are so manifest, that I shall be surprised if others are not using the same device, supposing, as did Mr. Hamilton and myself, that the idea was original.

In regard to our control weir overflow, it had been arranged to use the Blaisdell plugs. The manager, Mr. Scobey, suggested that the plug itself might be used as a weir. This was done by simply drilling rows of inch holes around the drum, spaced vertically 4 in. apart. These rows of holes are plugged in

succession, as the sand rises, and the device works perfectly. The sand on screening shows as follows: coarser than 100, 20%; between 100 and 200, 45%; finer than 200, 35%. It contains, however, very little coagulable slime, and leaches with exceptional readiness, both in the collector and in the treatment-vat.

A feature of this plant, which is supposed to be original, and which is giving remarkably satisfactory results, is the use of Wilfley tables for separators. By sending the sand-free slime from the head of the table, directly to the slime plant, and the sand with the small amount of remaining slime to the tube-mills, the use of cones and drag-classifiers is avoided, and apparently just as good a classification and tube-mill feed is obtained. There is positively nothing to clog or break, and the process is 'fool-proof'.

Tables have been used frequently as an aid in classification. I should be extremely interested to know if they have ever been used before in a plant, to the exclusion of other classifying devices.

P. R. WHITMAN.

Jalisco, Mexico, August 30.

[It would be interesting to ascertain when the Wilfley table was first applied as a classifier in conjunction with concentration. That system was being used at the Exposed Treasure mill, Mojave, California, as early as 1902.—EDITOR].

The Editor:

Sir—In your issue of August 21 I notice an article on 'All Sliming', by E. M. Hamilton, in which he criticises the practice of fine grinding as followed at many modern mills which are treating silver sulphide ores. Mr. Hamilton criticises the use of the term 'all-sliming' in mills when after re-grinding a screen-test shows from 15 to 20% of sand which is coarser than No. 200 mesh laboratory-screen. Technically, Mr. Hamilton is correct. It is not 'all-sliming'. As a matter of practice, however, the term 'all-sliming' is generally used to describe a degree of re-grinding when leaching becomes impracticable, in other words, where the resulting material is treated as slime. In many cases a considerable proportion of the material is still very fine sand, coarser than No. 200 mesh screen, but the proportion of impalpable slime is so great that slime-treatment is advisable. Mr. Hamilton cites the cases of two companies operating mills on the all-sliming system, where the sand coarser than No. 200 mesh amounts to 15 to 20%, and another case where the proportion was even higher. He justly remarks that such work is not sliming. He further remarks that this is bad metallurgical practice. This assertion seems open to dispute. It all depends on the ore. I know of cases where excellent results are being achieved from the treatment of slime containing from 15 to 20% fine sand, coarser than No. 200 mesh.

Take for example a silicious ore in which the metal is present in the form of rich silver sulphides, often minutely disseminated through the quartz. Such is a typical Tonopah ore. Here fine grinding is necessary in order to liberate the extremely fine particles of mineral from the gangue, and incident-

ally, to allow the cyanide solution to come into intimate contact with the particles of ore. Experiments show conclusively that extremely fine grinding is essential if these results are to be attained. The economical limit of reduction is fixed by two things: first, the difficulty of concentrating the very finely divided particles of mineral, and, second, the cost of re-grinding.

It has been conclusively proved that it is impossible to cyanide such an ore successfully until the greater part of the sulphide minerals have been eliminated. Further, that it is impracticable to reduce all the material issuing from tube-mills to a certain degree of fineness at one operation. As stated by Mr. Hamilton, the cost of re-grinding the 15 or 20% remaining, would be excessive.

Although it is impracticable to re-grind this small proportion of sand until it is reduced to a slime, it by no means follows that it would pay to classify and treat it separately. The additional cost of installation and operation of a small leaching plant would more than offset any possible increase in extraction. But there are other important reasons for not separating the small proportion of fine sand. Of these the most important is the effect during filtering. In filters of the submerged vacuum type, or even of the self-contained type, the permeability of the cake is increased enormously by a small quantity of fine sand, provided that the pulp is in a state of suspension while the slime-cake is being formed. During the experimental stage, before the Goldfield Consolidated mill was designed, a series of exhaustive tests were made along the lines advocated by Mr. Hamilton, namely, moderate re-grinding and subsequent segregation into sand and clean slime. This plan of treatment was only abandoned after it was found that the clean slime formed an absolutely impervious cake on the filter, from which it was impossible to displace the gold-bearing solution.

EDGAR A. COLLINS.

Tonopah, Nevada, September 3.

Silver, and its price, is attracting much attention in the Far East. According to *In Tinland*, when Lord Morley was asked last February what would be done if the value of silver rose above 43d. per ounce, that is, to a point at which the rupee would be of more value in the melting pot than as a current coin, the answer from the Secretary of State was prompt and decisive: "We shall be quite ready to cross the bridge when we come to it. Nothing would, as a matter of fact, suit India better than a rise in silver. If it went to the intrinsic value of the rupee (43d. per ounce or over), we should raise the issue price of the rupee to one-and-six, and would, of course, retain our rupee currency." If such a pledge as that had been given years ago it might have prevented the action of France and the United States which have had something to do with the fall in the white metal. But there is an enormous and growing demand for the Indian rupee in Africa, and the abandonment of any serious design by India to introduce gold as a medium of circulation—it was tried, and failed miserably—is a further assurance that the call for silver increases.

THE SOUTHERN ARIZONA COPPER FIELDS.

Written for the MINING AND SCIENTIFIC PRESS
By C. F. TOLMAN, JR.

(Continued From Page 360.)

The Morenci-Metcalf copper deposits are situated in the northeastern corner of the copper region, in Graham county, about 20 miles from the New Mexican line, and south of the great plateau, here bounded by the White mountains. The mining of copper has given rise to three important towns: Clifton, a smelter city; Morenci, a mining and smelting town; and Metcalf, a mining camp, largely Mexican. These three towns house about 15,000 people, all directly dependent upon the copper industry. Of all the camps of Arizona, this group of mining towns probably affords the greatest interest to the casual traveler. The railroad journey to Clifton presents excellent exposures of the Gila conglomerate, which inspires speculation even among the uninitiated. I was asked if great volcanic explosions had not scattered the boulders throughout the gravels, while another man was of the opinion that ice was the transporting agent.

The trip from Clifton to Morenci on the ore-train and up the Longfellow incline will long be remembered, the town presenting a curious mixture of fine buildings, smelters, concentrators, mines, tunnels, and looping railroads. Down over the incline again and up the railroad to Metcalf, the variegated porphyry-walls of the canyon present a vivid study in red and ochre. At Metcalf, inclines take one up Shannon mountain, its sides scarred by open pits, and finally the ride up the Coronado incline, which rises 1200 ft. in 2500, and a short climb to the summit, back of the Coronado mine, gives a fine view of the water-scoured country below.

GEOLOGY.

The producing area stands like an island, above extensive volcanic formations and the Gila conglomerate, together forming a portion of the great mantle that was spread over much of southern Arizona in later Tertiary and Quarternary times. The local geology and the ore deposits are better known than those of any other copper camp of the country. This is due to the work of Waldemar Lindgren, whose treatise on these mines contains not only an excellent description of the properties, but has also proved to be the most important contribution to the knowledge of the processes by which the copper deposits of the Southwest are developed. One who has examined the geological mine-maps and sections now kept up by the Detroit Copper Co., is struck with the accuracy of Mr. Lindgren's work, considering the data then at his disposal.

Mr. Lindgren has shown that the district presents a pre-Cambrian basal formation of schists and an old granite; then overlying unconformably a thin series of Paleozoic quartzite, shales, and limestones, totaling only 1000 ft., topped again unconformably by a few hundred feet of Cretaceous shales and sandstones which are not mineral bearing.

The Copper mountain irregular intrusion (see Fig. 4), occurred either in later Cretaceous or early Ter-

tiary times, and is, therefore, of somewhat later date than the Bisbee intrusion which was pre-Cretaceous or very early Cretaceous. It has an even more irregular shape than the latter. It forced an irregular entrance into the older rocks, and the contact is marked by a cross network of outstretching dikes.

Mr. Lindgren's scholarly analysis of the orebodies shows many varieties of deposits, both in the sedimentary rocks and in the porphyries and granite, both contact deposits and a variety of vein formations. Scientifically all these are of interest, but economically the disseminated chalcocite in the porphyry is alone the important economic asset of the field. The geological mine-maps show clearly the irregular way in which the Copper mountain intrusion has broken up through the sedimentaries. The cross-cutting dikes develop especially in the Longfellow limestone and adjacent shale, and the

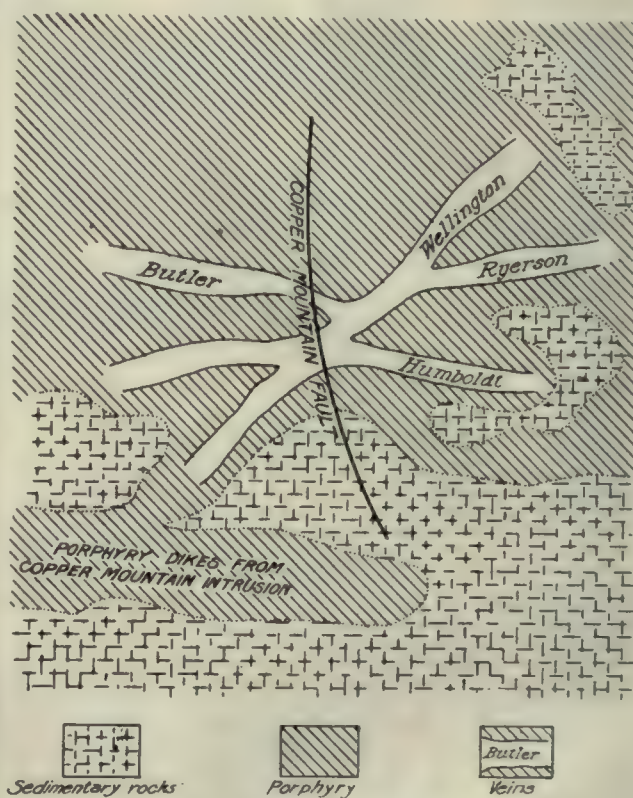


Fig. 5. Ryerson Group of Lodes.

Ryerson, Humboldt, Wellington, and Butler veins develop their large chalcocite orebodies in the porphyry, and are the wealth-producers at present. (See Fig. 5).

In general the chalcocite extends outward from fissures in the porphyry dikes and the main porphyry mass, but in the neighborhood of the contact, the fissure is often filled with a core of chalcocite, or chalcocite and pyrite. Although the pay-ore is confined to the fissure-zones, there is a disseminated ore, too low-grade to work, in much of the porphyry. The brilliantly stained porphyry in the neighborhood of Metcalf is said to assay from $\frac{1}{2}$ to 1% copper. The Morenci and Metcalf deposits are considered as related to the new larger type of disseminated ores, with this difference, entire rock masses are not pay-ore, only strips along fissure veins.

To give some idea of the size of these orebodies, one of the largest deposits opened is at the crossing

of the Humbolt and Ryerson veins, where a 300-ft. width of ore assayed 4% copper. Under ordinary conditions 2% is considered the lowest limit of pay-ore at present, and Norman Carmichael, manager for the Arizona Copper Co., states that 300 ft. is found to be the maximum thickness of the commercial chalcocite ore in Morenci. The outcrops of the great leads are singularly inconspicuous, strips of soft,

secondary sulphide zone is far above any permanent water-level, and while not disputing the evidence from which Mr. Lindgren deduces a water-level much nearer the surface in recent geological times, it does not seem necessary to postulate a definite water-level in order to have secondary sulphide enrichment. In the Old Dominion the secondary sulphides are found at a place far beneath the water-



Fig. 4.

leached, and slightly stained porphyry, hardly suggesting the wealth below. Mr. Lindgren's explanation on this point seems clear. Long-continued erosion has removed the original 'iron caps' that may have existed, while, migrating downward under the processes of secondary enrichment, the ore has accumulated, starting at a depth of 100 to 200 ft. below the surface. It is interesting to note that this

level, and in Cananea a case was noted where, on account of a thoroughly open, broken, hanging wall of an inclined deposit, the vein was leached from top to bottom along the hanging, while the secondary sulphides were deposited throughout the depth of the workings on the foot-wall. A high moisture-content in porous but fine-grained porphyry, seems sufficient to exclude oxygen and allow secondary reactions.

Another point noted that has interest in connection with theories of ore-formation, is that fine-grained disseminated chalcocite decomposes and oxidizes with great ease. Instead of being one of the most resistant of the sulphides, as stated by Mr. Weed, it is one of the most unstable under the attack of the oxidizing reagents. In Bisbee, sooty chalcocite, that was opened less than a year ago, was decomposing, and sulphate crystals half an inch long were seen. At Ray I was told of an engineer who entered some of the drifts, which were so covered with copper sulphate that the rock reflected blue to the candle. He refused to look further, saying that carbonate ores had no value. Had he rubbed off the sulphate crystals he would have seen the chalcocite underneath. Extensive development of the porphyry ores since Mr. Lindgren's examination has brought to light the fact that pyrite occurs above chalcocite. The explanation is evident. The chalcocite is less resistant, and is carried down more readily than the pyrite, the latter lagging above. Granular solid pyrite is reported 10 ft. above the chalcocite, and disseminated flakes of pyrite as much as 50 ft. above the top of the zone.

CORONADO VEIN.

The great Coronado fault-lode near Metcalf has a number of novel features. It is interesting to the transient visitor because its main geological features are written so plainly that they can be seen at a glance. The silicified breccia zone which marks the outcrop is along a fault of about 1200-ft. displacement, according to Mr. Lindgren. On one side the basal conglomerate of the Coronado quartzite can be seen, which on the other side caps the high summit of Coronado mountain. This splendid fissure vein averages 35 ft. in width, and the deepest working is reported to be 1000 ft. below the surface, showing a chalcocite orebody far thicker than any of the deposits at Morenci. The ore occurs in three shoots, namely, the Coronado, the Horseshoe, and the Boulder. The main developments are on the Coronado shoot, which has been proved for a length of 1500 ft. The matrix of the vein is ground and brecciated material, somewhat silicified, and carrying disseminated chalcocite. There are irregular patches of diabase in this crushed zone, and the evidence seems convincing that the diabase was introduced along the Coronado fault, and that continued movements crushed and stretched it out into irregular remnants. While possibly presumptuous for a casual visitor to take issue with Mr. Lindgren, who made such a laborious investigation of the field, it is difficult to see a genetic relation between the subsequent sulphide dissemination of the fissure and the earlier dike that intruded into the fracture, and was later crushed and mineralized. From a personal acquaintance with most of the important copper deposits of the Southwest, I have been forced to the conclusion that acid intrusives alone are capable of generating copper deposits in this region. Reasons will be given later for applying this to the Globe district, notwithstanding Mr. Ransome's conclusions in regard to the close connection between the diabase and the ore. On the 600-ft. level of the Coronado workings oxidized ore has been found below sulphide orebodies. The irregularity of

open fissuring that has caused the circulation of oxidizing waters under the sulphide zone above has not yet been discovered.

ECONOMIC CONSIDERATIONS.

The isolated situation of this field, the rugged character of the ground compelling the expensive railroad and gravity-tram construction, the expense of pumping water over a 1600-ft. lift to the concentrators at Morenci, the disposal of the tailing, and the scattered units preventing centralization and resultant economy, of necessity brings up the transportation and treatment charges, and the effort seems to be to offset this by lowering the mining expenses. This has led to the trying of some interesting varieties of caving methods. The increasing field offered by the Southwestern copper mines for the application of new mining methods makes it profitable not only to describe carefully each variety used, but also to discuss the advantages each may present.

MINING METHODS.

The top-slicing caving method is used by the Detroit Copper Co. to work out a triangular corner of ground between the claims of the Arizona Copper Co. and an old square-set stope, as shown in the figure. Cross-cuts are run on the sill floor 18 ft. apart, and raises are put up to the top of the ore at intervals of 25 ft. The top-slice of ore 8 ft. thick is taken out,



Fig. 6 Advancing Face, Top-Slicing Method.

the roof being supported by timbers, and a heavy mat of timbers is prepared. In taking-out each slice, a long-wall advancing method (to use a term borrowed from coal mining) is employed; the working face can be pushed out in any direction desired; the timbers being shot out behind when they show that they are taking weight. The upper slice is worked out before starting the second, and a layer of waste-boards is laid before shooting the timbers. Experience here shows that after the third slice the method is satisfactory and safe, but that during the extraction of the first and second slices the timbers have not yet been twisted into a mat, and unexpected falls of timbers out of the mat occur. As the number of slices taken increases, saving of timber can be made, for a thick mat comes down slowly and evenly, and some of the timbers can be pulled instead of shot. In this stope 18 ft. remained to be taken out before reaching a sill-floor. Instead of making two slices, it was decided to attempt removing it in one. This was done successfully, by using a temporary square set, and the mat was caved down on these timbers and then down to the floor, and after well started this thick slice was removed without difficulty.

ADVANTAGES OF THIS METHOD OF TOP SLICING.

The long-wall advance in any direction allows the

exploration of an irregular orebody, as long as the work is on the top of the ore. All the men are along a single working face, and this allows closer supervision. The ore breaks better than in overhead square-set mining, long lifters being possible in this case, and the product per man is therefore greater than in the square-set method formerly used. No saving in the amount of timbers can be expected until the operations are well advanced, but no careful framing is necessary, and they are placed much quicker than the square-set.

THE SUB-LEVEL METHOD; CAVING BY BLOCKS.

The operations may be summarized as follows: (see Fig. 7); (1) cross cuts 35 ft. apart from the main drift on the sill-floor; (2) raises every 30 ft., two-compartment, inside measurement 4 by 6 ft., chute 4 by 4, and balance the ladder way; (3) the sill-floor system of cross-cuts and drifts are repeated on each sub-level; the workings are directly over each other; the top 'sub' is about 30 ft. from the top of the ore; (4) cross-drifts are then run as shown in Fig. 7, dividing the upper 'sub' into blocks 35 by 30 ft. and 30 ft. thick; no mat is laid on top of

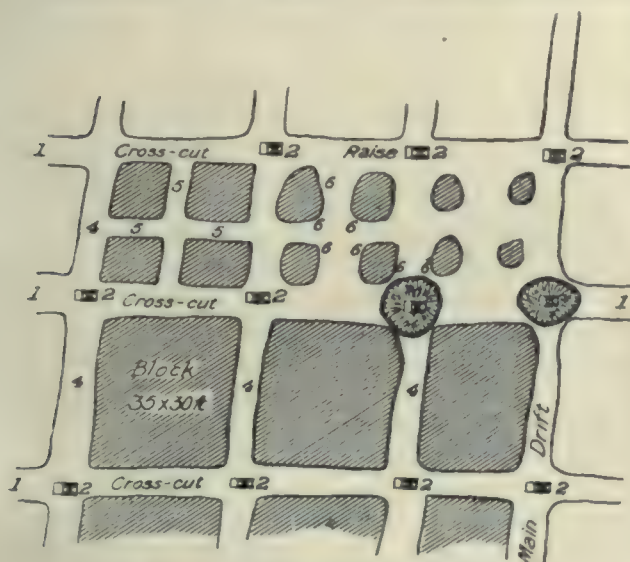


Fig. 7. Opening Rooms, Sub-level Method.

the ore; (5) each block is further divided by two cross-drifts, leaving four pillars to a block; (6) the pillars are sliced off on all sides, and the top of each raise blown out funnel shaped; (7) the roof is filled with holes; (8) at the first sign of weakening the pillars are filled with holes; (9) then a string of blocks, making a room 100 ft. long, are blown down. As many as 200 holes are shot at once; these are connected in multiple series, a single parallel not containing over 35 holes; the lighting circuit is used for the firing; (10) the roof stands arched, but no attention is paid to this, as the arch breaks after the second or third cave is made, and subsequent sections cave much better on account of the weight. The porphyry breaks in large blocks. Pieces 3 and 4 ft. diam. were noticed on top of the cave, but during the drawing and settling, the ore grinds itself up to such an extent that little trouble is experienced at the mouth of the chutes from large material. This method is an excellent one where the pillars will stand considerable slicing.

At the King mine in Metcalf, the special conditions

allow a cheap method of extraction. From the central drift running through the orebody, extraction-drifts are run into the country and around the ore, as shown in the sketch, and cross-cuts tap the ore. The orebody was completely under-cut, and caving started over the under-cut portion. The caving has proceeded satisfactorily up to the present, the cave confining itself to the portion under-cut, and the ore runs free for the shovelers stationed at the ends of the drifts, at A. This is the cheapest ore mined by the Arizona Copper Company.

FILLING METHODS.

A 'back' of ore 10 to 15 ft. thick is left above the main extraction-drifts and connections with the stopes are made by chutes. Above this 'back' a room is opened the width of the vein, averaging 35 ft. by several hundred feet long. Narrow pillars are left between the rooms, and these contain the man-ways. One-third of the ore is drawn, and the rest is left as a 'fill'. It is planned, on reaching the top of the ore, to lay a mat, cave the roof and pillars, and draw the ore. If the roof stands well, the ordinary method of drawing the ore and filling with waste may be adopted.

Summing up the changes made to meet the low price of copper, the following have been offered me

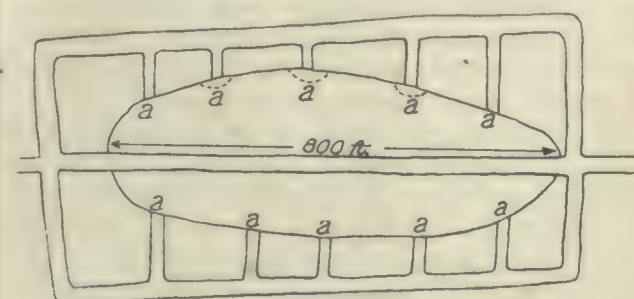


Fig. 8. Method Used at King Mine

by the men in charge: (1) The changes from the square-set to caving methods; (2) slightly raising the minimum grade of ore mined; (3) cutting down the exploration and dead-work; (4) besides these, the increased efficiency of labor, due to the hard times, has been perhaps the most important factor of all.

Paper money, first issued in 1881, has displaced gold and silver in Colombia, except small quantities of the latter, which are in circulation in certain districts remote from the capitol. Although reliable data have not been obtained, it may be concluded that the present outstanding issue of paper money is over ₱700,000,000, equal to \$7,000,000 gold, but some authorities place the amount as high as ₱1,000,000,000, equal to \$10,000,000 gold. The Government Mint, from August 1906, to June 30, 1908, coined silver to the amount of \$1,017,580, all in 30c. pieces, 0.835 fine. Some nickel coins, in ₱1, ₱2, and ₱5 pieces, have also been put into circulation during the past two years. No gold has been coined by Colombia in recent years. Some foreign gold is held by Colombian banks, and a limited amount thereof is in circulation, as well as foreign silver and bills. Exchange has steadily advanced from par, that is, ₱1 equal to 96.50 cents gold in 1874, to ₱189 equal to \$1 gold, in October 1902.

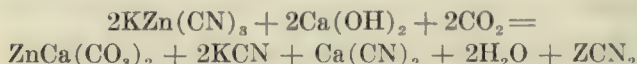
ZINC-BOX WHITE PRECIPITATES.

By ROY F. COOLIDGE.

*There seem to be two principal kinds of white precipitate; first, that containing large amounts of salts of cyanide, and second, that containing few or no salts of cyanide. The objection to this precipitate is similar in all plants, regardless of its exact nature, and as a rule the cyanide man will not admit that there are any white precipitates in his zinc-boxes. J. M. Tippet, chemist and metallurgist at the Portland mill, Colorado Springs, Colorado, describes the formation of a white precipitate in zinc-boxes as follows:

"A white precipitate forms on all the boxes at the head compartment, this condition being more pronounced on the weak side—in fact so great is the amount formed on this side that it necessitates a separation of this muck from the fine zinc when we clean up. It readily falls off when the zinc is disturbed. It consists of calcium ferro-cyanide, zinc hydrate, calcium sulphate, calcium carbonate, and fine slime from the sand filters. The formation of this white precipitate in such large quantities on the weak side is a rather curious fact, when it is remembered that the strong side carries the strongest percentage of lime. The only explanation I can give for it is that the solution is so weak in both cyanide and protective alkalis that it has not sufficient strength to hold it in solution when in contact with the zinc."

W. H. Virgoe, in a paper on the 'Consumption of Zinc in Cyanide Plants',† states that solutions of KCN containing zinc, that have been in contact with ore with which lime has been mixed, will gradually deposit in the sump-tanks a quantity of light, white precipitate, which forms first as a scum on the surface of the solution, and which consists of lime and zinc perfectly free from combination with cyanogen. This precipitate consists of carbonate of lime and zinc, the CO₂ coming from the atmosphere.



G. W. Williams states that "The well known white precipitate which forms in the zinc-boxes consists in the main of hydrated zinc oxide, together with a small amount of calcium carbonate and alumina. In addition to the above it always contains ferro-cyanides, often as much as 8%, and it is formed by the action of ferro-cyanide on freshly precipitated zinc oxide." Prister and Bay, in a paper on 'The White Precipitates Formed in Zinc Boxes at Cyanide Works', gives the following analysis and discussion:

| | % |
|---|-------|
| K ₂ Zn ₃ (Fe(CN ₆) ₂) | 10.45 |
| Zn(CN) ₂ | 22.73 |
| Zn(OH) ₂ | 54.79 |
| CuO | 0.40 |
| Fe ₂ O ₃ | 1.00 |
| SiO ₂ | 1.03 |
| Water (at 115°C.) | 8.07 |
| Loss on ignition | 24.72 |

"The loss on ignition is due to the loss of water

when zinc hydrate is present, decomposition of Zn(CN)₂ and K₂Zn₃(Fe(CN₆)₂ and to organic matter. The large quantity of zinc cyanide present in this white precipitate explains, first, part of the loss of free cyanide indicated by the difference in test from 'head' and 'tailing' of the same box; second, how the excess of zinc-salts is partly eliminated from the solutions. We found that the clean white precipitate contained 14.6% of CN corresponding to 35% of KCN, which is equal to 750 lb. of KCN in one ton of white precipitate."

The white precipitate treated in this paper was received from the Kendall Gold Mining Co., of Kendall, Montana. The ore is oxidized, silicious, is altered from limestone occurring in a formation near the intrusion of a porphyry dike. The analysis of the ore is as follows:

| | % |
|--------------------------------|----------------|
| Loss on ignition | 3.46 |
| SiO ₂ | 75.94 |
| Al ₂ O ₃ | 10.98 |
| Fe ₂ O ₃ | 1.89 |
| CaO | 3.15 |
| MgO | 1.94 |
| SO ₃ | 0.46 |
| | 98.33 |
| CO ₂ | 1.85 |
| Na } | |
| Ag } | traces |
| Au | \$4.80 per ton |

An outline of the treatment is as follows:

(1) Ore is crushed dry to 3/8-in. mesh and is placed in the tanks (dry) with 1 lb. of lime per ton of ore. (2) Tank is charged with strong solution (3 lb. of KCN per ton of solution) through the bottom of the tank. (3) Tank is leached with strong solution 144 hr. (4) First wash water run on tank. Strength 1.5 lb. KCN per ton of solution. (5) Second wash-water run on tank. Strength 0.5 lb. KCN per ton of solution. (6) Fresh water run on tank. (7) Tank drained 8 hr. (8) Tank sluiced 4 hr. Total time of treatment 10 days. The ore-value or tank-heads assay from \$3 to \$8 per ton.

The precipitation of the gold is by means of zinc shavings. The zinc-boxes used for the strong-solution are above the storage-tanks and consist of 8 double boxes. Each double box (4 by 14 ft.) contains two rows of 8 compartments each, 7 of which are packed with zinc and the last one used for settling. The size of compartments is 1 1/2 by 1 1/2 by 2 ft. and the bottom slope 1 1/2 in. per foot. Each compartment has capacity of 4 1/2 cu. ft., making an aggregate zinc-holding capacity of 520 cu. ft. The total weight of zinc in the above described boxes is 4420 lb., or 8 1/2 lb. per cu. ft. The amount of solution passing the strong boxes is from 800 to 1000 tons per 24 hours; or from 1.5 to 1.9 tons per cu. ft. of zinc-content. The zinc consumption is about 0.5 lb. per ton of ore treated, or 0.09 lb. per ton of solution in circulation. The zinc-shavings are cut from No. 9 sheet zinc, and are 1-1400 in. thick. The strength of the strong solution is 3 lb. of cyanide per ton and protective alkalinity from 0 to 0.2 lb. Very little lime is used, owing to the oxidized condition of the ore, and the absence of cyanicides. The boxes used for the precipitation of the weak solutions and the wash-water are four in

*Abstract from Western Chemist & Metallurgist, Vol. V, No. 8, Aug. 1909.

†Jour. Chem. Met. & Min. Soc. of S. Africa, Vol. IV, p. 91.

number, and are over the sump tanks. The amount of solution and 'wash' passing the above boxes is from 500 to 600 tons per 24 hr. Precipitation in both strong and weak boxes can be called good, as the head samples to the strong boxes run from 80c. to \$1.50 per ton, and to the weak boxes from 10 to 50c. per ton, while the tailing samples from both are less than 4 cents.

The zinc-shavings in the weak boxes become somewhat coated with the white precipitate, the analysis of which will follow. The weak boxes require as much or even more attention than the strong boxes, although this is not the practice at most plants. The total consumption of cyanide is in the neighborhood of 0.5 to 0.6 lb. per ton of ore treated. Both strong and weak-boxes are cleaned up twice a month and the method of procedure is as follows: fresh water is run into the head compartment to replace the cyanide solution, then the zinc is removed and the water is siphoned from the two head compartments into a settling tank 4 by 4 by 8 ft., as there are no discharge launders to the zinc-boxes. The slime is now removed from under the screen ($\frac{1}{8}$ -in. mesh); then the zinc is replaced and moved up as well as the solution from the lower compartments.

The water in the settling tank is allowed to stand 48 hr., then the bulk of water is siphoned off and run to waste, while the remaining water is siphoned into another small settling tank, and the fine slime taken up in buckets. The cut-down apparatus consists of a wooden tank (6 ft. diam., 4 ft. deep) provided with a hood and an electric-driven exhaust-fan, a pressure-tank, and a filter-press. Sulphuric acid is used for cutting down the product, the consumption being one bucket of acid to four of product. This is carried out in the usual way, adding the proportionate amounts of slime, acid, and water as the cut progresses. One feature of the cut-down that has proved exceptionally successful is the use of steam to heat the solution, near the end of the treatment, as the acid at this point becomes inactive, and the heating of the solution brings about a violent action. Hot washes are found much more effective than cold washes in dissolving out the soluble sulphates.

There are two kinds of white precipitates formed at the Kendall mill. White precipitate No. 1 is always found in the zinc-boxes to a greater or less extent, and is abundant when the mill solutions become foul with zinc and other salts. It is found most abundant in wash-water boxes where the strength of free cyanide is low, and when the gold value of the head samples to the boxes is low. It is light and flocculent, and floats in the boxes when the zinc is moved slightly. There is little or no protective alkalinity in the solution when it enters the zinc-boxes.

ANALYSIS OF WHITE PRECIPITATE NO. 1.

| | % |
|--------------------------------------|-------|
| Water at 100°C..... | 5.06 |
| Loss on ignition..... | 23.30 |
| *ZnO | 37.46 |
| SiO ₂ | 13.12 |
| Al ₂ O ₃ | 5.84 |
| Fe ₂ O ₃ | 1.55 |
| CaO | 3.62 |

| | |
|-----------------------|--------|
| MgO | 5.12 |
| SO ₃ | 4.42 |
| Au | 0.48 |
| Ag | trace. |

$$*Zn = 30.09 \quad Zn(OH)_2 = 45.74.$$

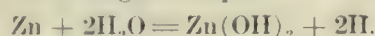
White precipitate No. 2 was taken from bottom of the acid-treatment tank after the gold-slime had been treated with H₂SO₄ and washed out. It is only slightly soluble in H₂SO₄ and undoubtedly comes from the white precipitate (No. 1) formed in the zinc-boxes. It is light colored, and heavier than precipitate No. 1. It is not hard to wash from the gold slime, although some of it is washed out with the gold slime and goes to the melting furnace.

ANALYSIS OF WHITE PRECIPITATE NO. II.

| | % |
|--------------------------------------|--------|
| Water at 100°C..... | 2.57 |
| Loss on ignition..... | 14.10 |
| ZnO | 2.07 |
| SiO ₂ | 1.69 |
| Al ₂ O ₃ | 2.32 |
| Fe ₂ O ₃ | 0.33 |
| CaO | 35.19 |
| MgO | 0.17 |
| SO ₃ | 39.65 |
| Au | 2.39 |
| Ag | trace. |

The analysis of the above white precipitate was made as follows: a weighed amount was treated with HCl and HNO₃ heated and filtered, and the residue fused with sodium and potassium carbonates.

The causes of the formation of this white precipitate may be very complex, but may be explained somewhat, after the chemical composition is known. Zinc is the principal element in these white precipitates and is present as the hydroxide. This is formed by the action of decomposed water on the zinc. The water is decomposed by the electro-motive force developed by the zinc-gold couple.



Calcium, iron, aluminum, and magnesium are found in small quantities in the white precipitates. The gold present is mechanically mixed with the precipitates. The objections to the white precipitates are many and in one year's time they add greatly to the cost of operation. They cause poor precipitation in that they coat the zinc shavings and clog up the screens. In plants where the cyanide radical is found in the white precipitates, the amount of cyanide lost in this way is large. In South Africa, Prister and Bay found 14.6% of cyanhydric acid which corresponds to over 35% of KCy or one ton of this precipitate would correspond to 700 lb. of KCy.

The consumption of zinc due to the formation of this white precipitate is also very great. The white-precipitate analyzed in my tests contained 30.89% of zinc, which is equivalent to 600 lb. of zinc per ton of precipitate. The cost of clean-up is somewhat increased as it is difficult to wash all the white precipitate from the slime. I made several tests on the solubility of this white-precipitate in KCy solution and found that it was quite soluble. This was reported to the cyanide man at the Kendall mill, who increased the mill solution to 3 lb. KCy per ton of solution with one pound protective alkalinity, and has just reported that he is now little troubled with white-precipitate.

SIMMER DEEP AND JUPITER REDUCTION WORKS.

Written for the MINING AND SCIENTIFIC PRESS

By J. E. THOMAS.

The joint reduction works of the Simmer Deep, Ltd., and Jupiter G. M. Co., Ltd., were erected and put into operation on September 1, 1908, to treat the ore from these two companies' mines, both of which are under the control of the Consolidated Goldfields of South Africa, Ltd. Separate mill-bins of 5460 and 2525 tons capacity are provided, the ore from each mine being treated separately until it leaves the mill-tables, when it mixes on entering the tube-mills and thence the cyanide plant. The recovery obtained by tube-milling and cyaniding is apportioned to each company on the basis of the tonnage and value of the tailing leaving each company's mill-tables.

Briefly the processes are as follows: breaking the ore to $1\frac{3}{4}$ -in. cube at each of the company's sorting and crushing stations; transport by means of hopper-bottomed cars of 35 and 45 tons capacity, drawn by a 48-ton locomotive on a 42-in. gauge track; stamp-milling with heavy gravity stamps of the Californian type, and amalgamation over stationary copper plates; tube-milling and amalgamation over copper shaking-tables; classification of slime and sand by means of cone-classifiers; treatment of sand by means of rotary filter-tables and wet-filling of tanks with cyanide solution, with subsequent transfer and percolation with cyanide solution; treatment of slime by the decantation process; precipitation of gold from solutions by zinc shavings, using zinc-lead couple; acid-treatment of gold-slime; calcining, and smelting.

The mill consists of 300 heads of stamps arranged five in each mortar, in blocks of 10, each 10 stamps being driven by a 50-hp. 3-phase electric motor. The current is generated and supplied by the Victoria Falls (Transvaal) Power Co., from their station at Brakpan, about 20 miles distant. The framing of the mill-buildings and bins is entirely of steel girders, the bins, themselves, being of timber 6 in. thick on the sides and 6 in. at the ends. The mortars are of the straight-backed type and are specially heavy, having a bottom 15 in. thick. Each weighs 11,872 lb. They are placed on concrete foundations, separate foundations for each 10 stamps, 17 by 10 ft. at the base and 15 by $4\frac{1}{2}$ ft. at the top and 10 ft. high. Each block contains about 102 tons of concrete, and has a sheet of best rubber $\frac{1}{4}$ in. thick between the bottom of the mortar and the concrete. The anchor bolts are 6 in number $1\frac{3}{4}$ in. diam. by $7\frac{3}{4}$ ft. long, so placed as to be readily accessible for tightening and replacing. The mortars are 6 ft. high, taking a 59-in. screen-frame. The height of the screen opening is 24 in. Each box has five 1-in. openings for the admission of water from the back-water service. These are so arranged as to give a jet of water playing on each die at an angle of 45° to the surface of the die. Manganese-steel liners are fitted in each box to take the wear due to attrition. The stamps weigh 1670 lb. each, when new, made up as follows: stem, 723 lb.; tappet, with gibs and keys,

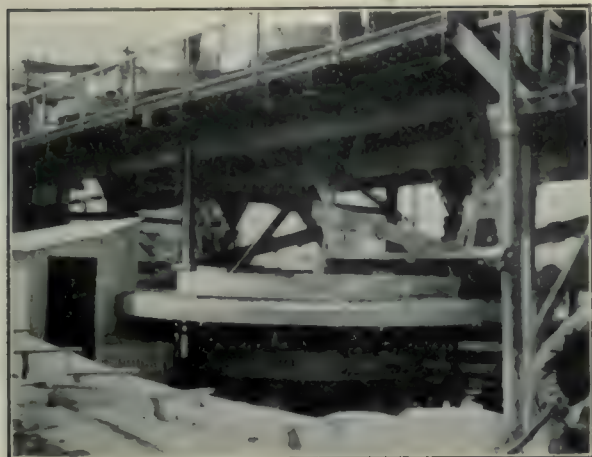
252 lb.; head, 410 lb.; shoe, 285 lb.; stems are 4 in. diam., placed at $10\frac{3}{4}$ in. centres. The order of the drop is 1, 3, 5, 2, 4. The set height is $8\frac{1}{2}$ in. Height of discharge 4 in. and number of drops 100 per minute. The estimated duty per stamp is 8.7 tons per 24 hours, but this has already been exceeded using a 500-mesh screen, 0.033 in. aperture.

The king-posts are of timber of the 'built-up' type, to prevent twisting, and are seated in cast-iron shoes resting on the rubber on the concrete foundations. This also obviates an unnecessary amount of timber above the cam-shaft bearings. The cam-shafts are 16 ft. 3 in. long and 7 in. diam., and the majority are of the 'riffled Blanton' type. Other methods of fastening the cams on the shafts are also being used. The feeder-chutes are provided with sliding doors on the bins, while the feeders themselves are driven by means of $\frac{3}{4}$ -in. manila ropes from rocker-bars placed at the back of the king-posts above the cam-platforms. The front of the cam-platform is supported directly from the concrete foundations, independently of the king-posts. The reduction of the vibration on the platform, due to this method, is noticeable. The mill clean-up room is spacious and contains 3 revolving drums for cleaning amalgam; 3 amalgam barrels; 3 bateas, and a clean-up table sump. Besides these, a small tube-mill 6 ft. 6 in. by 5 ft., with a shaking table, two 10 by 10 ft. conical-bottom vats, and a precipitation-box, for the treatment of black sand, barrel, tailing, and the like by tube-milling and cyaniding, are provided. Two retorts and three Cornish fires are also in this room so that the amalgam is retorted and the bullion run into bars before leaving the mill-buildings.

The carpenters' and mill-fitters' shops are under the same roof as the clean-up room, but are separated therefrom by a fire-proof brick wall. The only entrance to the clean-up room is from the mill, past the mill-foreman's office.

The arrangement of the batteries back to back, 150 stamps on each side, with the bins between, admits of extensions being easily made at the southern end of the mill. The motors drive down to small counter-shafts, one for each 10 stamps, which are placed below the feeder and motor-floor, by means of 11-in. belts. Thence the drive goes direct by means of a 21-in. belt to the 7-ft. cam-shaft pulleys. The counter-shafts are moved by means of bevel-gear wheels, so as to take up the stretch in the motor and cam-shaft pulley-belts. On leaving the mill tables the tailing passes through mercury traps and launders to the tailing-pits, of which there are two, one for the 200 Simmer Deep, and one for the 100 Jupiter stamps. From there the pulp is elevated by means of 8-in. centrifugal pumps, three to one pit, and two to the other, only one in each pit being normally run at a time, to the cone-shaped tube-mill classifiers. Of these there are two to each of the four tube-mills, 45 in. diam. at the overflow and 7 ft. deep, with a $\frac{7}{8}$ -in. nozzle at the underflow. These, in turn, deliver into a de-watering cone, 36 in. diam., and 5 ft. deep for each tube-mill, with a $1\frac{1}{4}$ -in. nozzle at the underflow. The overflow from these de-watering cones joins the stream at the tube-mill outlets so as to make the re-ground pulp fluid

enough to pass over the shaking-tables; of which there are five, 12 by 4 ft. 7 in. to each tube-mill, and which run at 200 shakes per minute. The tube-mills are of the Krupp type, and are 22 by 5 ft. 8 in. inside in the shell, and are lined with 5½-in. local flint-sets. Each mill is driven by a separate 125-hp. electric 3-phase motor, and running at 30 rev. per min., takes about 104 hp. The pulp passes from the underflow of the de-watering cones through Pryce's feeders, through which are also fed the pebbles to maintain the pebble-load in each mill about 6 in. above the centre. These pebbles are pieces of ore about 4 in. diam. picked off the belts of the sorting stations, and delivered to a special bin from which they are trammed to the tube-mills in small cars of 10 cu. ft. capacity. The average working-load of pebbles, in each mill is about 10 tons, and about 5 tons per mill per day are fed in to maintain this. The tailing from the shaking-tables joins the main pulp in the tailing-pits and is re-elevated to the classifiers, any particles that still require re-grinding passing down again through the classifiers, the remainder overflowing with the fine product in the mill-tailing, to the cyanide works. A small lo-



Continuous Sand Collector.

comotive-type boiler is installed in a separate shed, outside the mill buildings, to provide steam for steaming plates.

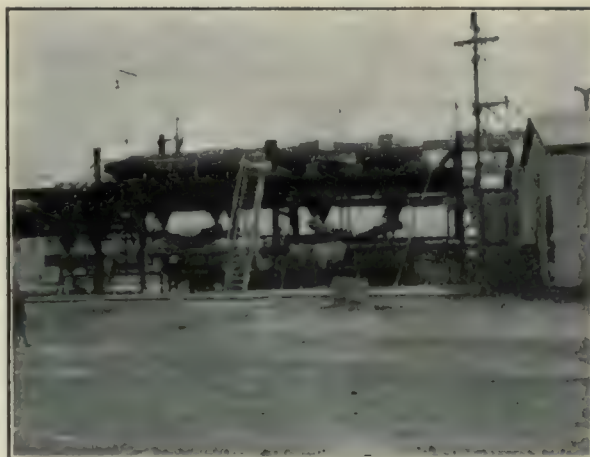
Hand samples of the pulp entering the cyanide works are taken every hour at the overflow-launders of the tube-mill classifiers, and reserved for grading and assaying. The pulp is then run to 12 cone classifiers, placed in parallel, 6 ft. diam. at the overflow, and 6 ft. 6 in. deep with a 2½-in. nozzle and internal regulating plug at the underflow. The pulp overflowing from these classifiers flows directly to the slime plant, passing over 10 return-sand spitzkasten on the way. The underflow, containing about 4% slime, is pumped by means of a 6-in. centrifugal pump to the cones of the continuous sand-filter plant, with the addition of a little clear water. This plant consists of two rotary filter-tables 20 ft. diam., with a 2 ft. 6 in. filter-bed, equal to 137 sq. ft. each, revolving at a speed of one revolution every three minutes. The filter is composed of strong screen cloth, supported on wooden slats on edge, 4½ in. centres, over which is laid cocoa-matting, well caulked at the inner and outer edges. On this again are

placed strips of unbleached calico to prevent any slime, which may penetrate through the working-bed of sand, 1½ in. thick, choking the cocoa-matting. Over each of these tables four cones, 8 ft. diam. at the overflow and 8 ft. deep, are placed. The pulp overflowing after passing over two return-sand cones of the same dimensions, joins the main stream to the slime-plant. The underflow, containing about 30% moisture and 1% slime runs down launders of 30% grade on to the filter-beds. The under-



Tube-Mills and Slime Plant.

side of this bed is connected to a vacuum-pump, through a receiver, the moisture collecting in which is removed by means of a 3-throw plunger-pump, and returned to the main tailing-stream. A vacuum of from 5 to 10 in. is found most effective; if higher, the sand of the filter has become choked with slime and requires renewing. This is usually done once every 24 hr., the operation taking about 50 min. for both tables. Only three cones are normally in use for each table, the fourth being only used when the



Sand Plant and Filter Tables.

other table is out of action for renewal of the filter-bed or other parts. One table, working with four cones, is capable of dealing with about 60 tons of sand per hour for four or five hours. Both the primary and secondary cones are provided with diaphragms placed about 2 ft. above the underflow. The sand, containing about 15% moisture, is removed from the table by means of a plough, and falls into a launder in which a 0.03% KCy solution is running. Thence

it is elevated by means of a centrifugal pump to the collecting vats. Of these there are eight in use, two being utilized for storage and the other six for collectors. These vats are 50 in. diam. and 8 ft. 3 in. above the filter-mat, and are fitted with Butters and Mein distributors, and annular overflow launders. The solution overflowing the vat that is being filled runs into one or other of the storage-vats from which it gravitates back to the launder at the rotary filter-tables, and is again pumped up with fresh sand from the tables. Means are provided for removing any accumulation of slime in the storage to the slime-plant for treatment. Each collector-vat averages 738 tons of dry sand. After being filled and leached dry the charge is removed through 10 bottom-discharge doors on the three shuttle-belts which in turn discharge on to the main belt. These shuttle-belts are mounted on rails, and so arranged that they can be readily shifted from one vat to another by means of a traversing gear. Altogether there are six shuttle-belts 42 ft. centres and 32 in. wide for discharging the collecting-vats so that while three are being used the other three can be placed in position under the next vat to be discharged and so save time. The time required to empty a collecting-vat of sand is $3\frac{1}{2}$ hr., the shoveling, being done by 24 natives. From the main belts, of which there are two, one set 275 ft. centres and 28 in. wide, and the other 453 ft. centres and 28 in. wide, driven by two separate 20 and 50-hp. motors, the sand passes to another shuttle-belt 260 ft. centres and 32 in. wide, running on staging between the treatment-vats, 50 by 10 ft., arranged in two rows of five. From the shuttle-belt it is then discharged to Blaisdell distributors, two in number, each running on rails over each row of treatment-tanks. The sand is discharged from these after completion of treatment by means of 20 cu. ft. trucks fitted with side-jockeys and wire-rope mechanical-haulage to the two residue dumps.

The slime-plant is of the decantation type, and consists of four collector-vats 70 by 12 ft. deep at the sides with a cone 5 ft. 6 in. deep, equal to a flat-bottom vat 70 by 13 ft. 10 in. deep. There are also four first-wash vats, one intermediate transfer-vat and four second-wash vats, of the same dimensions. Each vat is capable of holding 400 tons of dry slime and 1400 tons of solution, and is fitted with a centre-valve which also contains a $2\frac{1}{2}$ -in. nozzle for solution to facilitate transferring and discharging of the slime-pulp.

This is accomplished by means of two 12-in. centrifugal pumps, with 16-in. suction and discharge-pipes. Only one of these pumps is used on any one vat at a time, but they are so arranged that either pump can be used on any vat for one operation, while the other is being used for another operation on any other vat. The first-wash solutions are decanted by gravitation to a small vat 20 by 6 ft. fitted with an annular overflow-launder. This allows of the settlement of calcium carbonate from the solution, which would otherwise choke up the cloths of the clarifying presses. The solution is pumped from this vat by a 6-in. centrifugal pump through three clarifying presses to a steady-head

tank; thence to the extractor-boxes. The second-wash solution can also be run through this system to the extractor-boxes if desired, but is normally pumped through a 6-in. centrifugal pump to the first-treatment vats or intermediate second-wash storage as required. This is of the same dimensions as the precipitated slime-solution intermediate-storage, namely, 70 by 12 ft., and is placed alongside it. The solutions from these storages is pumped through either of two 3-in. centrifugal pumps with 12-in. suction and discharge pipes, to any of the nine treatment-vats. A separate 6-in. centrifugal pump is provided to deal with the water decanted from the slime collector-vats. This water joins the stream from the annular overflow launders of these vats, and runs to the return-water vats, one 70 ft. by 16 in., fitted with an annular overflow-launder delivering into a second also 70 ft. diam. and 12 deep. This minimises the risk of slime remaining in suspension in the water returned to the mill. From the return-water tanks the water is pumped by three 8-in. centrifugal pumps to the mill-service tanks. Of these there are two, one 40 by 14 ft., and the other 40 by 12, mounted on staging 22 ft. high and arranged in the same manner as the return-water vats. Outside the extractor-house is a shed containing one vacuum and one 3-throw plunger-pump, used to assist leaching, and to aerate sand-charges while under treatment in either the collecting or treatment-vats. The extractor contains 20 steel zinc-boxes 30 ft. long and 5 ft. wide, each divided into two boxes of six compartments.

Twelve boxes are placed on the north side for dealing with solutions from the treatment of the sand. Of these, two are used for strong solution (over 0.05% KCy), the remainder being for weak solutions. One of the latter can be used for either weak or strong solutions, as desired. The other eight boxes are placed along the west side of the extractor-house near the clarifying-presses and deal with solutions from the slime-plant only. Each of the clarifying-presses contains 48 hollow frames 32 by 32 in., and gives 600 sq. ft. of filtering area, and is placed in a shed just outside the west side of the extractor-house.

The clean-up room for acid-treatment of the gold-bearing zinc-shaving from the extractor-boxes is in the middle of the extractor-house, the zinc-cutting lathes occupying the east side and the refinery the south side of the building. The extractor-boxes, clean-up room, and refinery are fenced in so that no unauthorized person may enter. The acid-treatment plant consists of three dissolving vats 10 by 6 ft. and three washing vats 10 by 10. These are all provided with mechanical stirring-gear. Bi-sulphate of sodium is used for dissolving the zinc from the boxes. This is dissolved in water in a lead-lined vat 10 by 10 ft., so as to give a solution containing about 18% free sulphuric acid. This is diluted with its own bulk of water before being used in the zinc-dissolving vats. The bi-sulphate dissolving-vat is placed at the south end of the shed containing the clarifying presses, with a small boiler of the locomotive type between. This latter is used for heating the bi-sulphate solution when necessary, and for obtain-

ing steam and hot water for the various small jobs, such as washing the cloths of the clarifying presses, washing the acid-treated gold-slime in the filter-presses, and so on. These filter-presses, of which there are three, 24 by 24 in., stand in the same room as the acid-treatment vats. The washes decanted from the acid-washing vats flow into two wooden vats 25 by 12 ft. where they are allowed to stand for several days, and, if necessary, treated with zinc-dust before being run to waste. The solution from the strong extractor-boxes runs into two steel storages 40 by 12 ft., that from the weak boxes into two 50 by 12, and the solution from the slime-boxes into one storage 50 by 12. Another storage of the same dimensions is also provided for surplus solution, that is, last drains from the sand-treatment vats, low in gold, waiting to be transferred to the slime-plant for the sake of its free KCy.

The refinery, which occupies the south side of the extractor-house, contains, besides a fluxing-room, one reverberatory pot-furnace capable of holding 26 No. 100 pots; one calcining furnace; one pan furnace for smelting slag, sweepings, and the like; one cupel furnace, and three Cornish fires for melting and casting the bullion into bars. As at the mill no gold-bearing material leaves the extractor-house except in the form of bars of bullion ready for depositing in the bank. All the furnaces in the refinery lead into one main flue 3 by 2 ft. 6 in. ending in an iron stack 90 ft. high by 5 ft. 6 in. lined for 40 ft. of its height with fire-brick.

The whole of the German output of cyanide, so far as can be learned, is controlled by the Deutsche Gold und Silber-Scheideanstalt, of Frankfort, which has agreements with the various manufacturers to take over their product, or to compensate them in some manner for keeping out of the market. Five different firms practically confirm the following written statement of one of their number: "I should advise you to apply for information to the Deutsche Gold und Silber-Scheideanstalt, in the hands of which, so far as we know, the sale of the production of all German cyanide makers is united." The concern mentioned has an American house, which controls the sale of German cyanide in the United States. Orders from Mexico are filled from Frankfort, and a Hamburg firm is the sole agent for Africa and Australia. From being a losing business, demoralized by low prices, the sale of cyanide has become a presumably profitable branch of the general business of the Deutsche Gold und Silber-Scheideanstalt, which, on March 31, 1908, according to the published annual report, paid 30% dividends on a capital of \$2,380,000, besides accumulating a reserve of \$1,856,400 and unpaid profits of \$238,000. The Frankfort company has relations with three American concerns, one of which sells its products in the United States. These companies, while suffering from a decrease in business, have been spared large direct losses, so that dividends as in the previous year could be paid. The Deutsche Gold und Silber-Scheideanstalt has established, or in part supported, eight concerns in Austria, France, Germany, and Switzerland. According to informa-

tion from reliable Hamburg exporters, it has been impossible, since the organization of this trust, commonly described as the syndicate, to buy cyanide in the open market for export to the United States.

OXYGEN IN COAL.

Recent investigations by the United States Geological Survey have shown that oxygen, so essential to all life, forms in coal an impurity that is almost as injurious as the ash content. The subject is of great importance to the consumer. David White, an account of whose investigations on the subject has just been published by the Geological Survey as Bulletin 382, was led to these conclusions by work undertaken in an attempt to devise classification of coals. He states that oxygen and ash are of very nearly equal negative value, ash being probably a little more injurious in most coals; and that the calorific value of coals in general is indicated by the balance between the total carbon on the one hand, and the sum of the two great impurities, oxygen and ash, on the other. The practical application of these statements appears in considering the effect of the exposure of coal to the weather. The weathering of the lower grades, especially lignites, bituminous coals, and peats, is marked by the accession of oxygen, which is taken into combination. This increase of the oxygen content causes a calorific deficiency, which is often serious. It is possible that in many cases considerable increase of oxygen and consequent loss of efficiency are suffered by the lower-class fuels after removal from the mine and before reaching the consumer, and it is probable that in the sub-bituminous coals, and more especially in the lignites, oxygenation begins immediately after the coal is blasted down. A comparison of the calorific values of the car and mine samples seems to warrant the apprehension that in some cases at least considerable deterioration occurs.

A series of investigations on the mineralogical composition of the best rocks for road building made by Edwin C. Lard, of the office of public roads, Washington, D. C., leads to the following conclusions: (1.) Igneous and metamorphic rocks, owing to a higher degree of crystallization, and a preponderance of silicate minerals, offer a greater resistance to abrasion than nearly all varieties of sedimentary rocks. (2.) The coarse-grained intrusive rocks of the igneous class are harder, but break more readily under impact than the finer-grained volcanic varieties of like mineral composition. (3.) The deleterious effect of atmospheric weathering on the wearing qualities of rocks has been demonstrated. (4.) The cementing value of rocks is, to a certain degree, measured by the abundance of secondary minerals resulting from rock decay. (5.) Metamorphic rocks have, as a rule, a low binding power, owing to a regeneration of secondary minerals, and to the effect of heat and pressure. The foliated types part readily along planes of schistosity, and, therefore, are not well adapted to road construction. (6.) The quantitative mineral analysis of rocks serves to a certain extent as a measure of their useful properties for road construction.

DEVELOPMENT OF MODERN THEORIES OF ORE-DEPOSITION.

By S. F. EMMONS.

*In my endeavor to trace the progress of thought in regard to the genesis of ore deposits, you must not think me too egotistical if what I have to say is considerably personal in its nature, for in such matters one cannot, to any great extent, assume the right to speak for others. When I first became connected with Government surveys, a little over 40 years ago, the people in the western United States, to whom it was necessary to appeal for the means for carrying on a Geological Survey, had little conception of the advantages and uses of such an organization, and a campaign of education was necessary to demonstrate its practical value. For 10 or 12 years such a demonstration was being carried on by the so-called Hayden, King, Wheeler, and Powell surveys, or geological explorations, as they might more properly have been denominated. Most of them appealed to the popular as well as to the scientific imagination, by their brilliant discoveries of such natural wonders as the geysers of the Yellowstone, the canyons of the Colorado, and the laccolites of the Henry mountains. The Geological Exploration of the Fortieth Parallel, which alone planned to make a geological map of a definite and limited area, secured its appropriation from Congress on the explicitly economic ground that it was necessary for determining the character of the mineral resources of the mountainous regions to be made accessible by the recently authorized trans-continental railroads. In furtherance of the plan of popular education, Clarence King, its organizer and chief, pushed to immediate publication the economic results of the work, the study of actually developed mines, including the Comstock lode, set forth in the volume on Mining Industry, which appeared in 1870, seven years before those embodying the more abstract scientific results which had to wait the completion of the researches of specialists. The realization of the ultimate object that the geologists of the Fortieth Parallel Exploration had in their minds during the ten years spent on that work came earlier than had been anticipated, when in 1879 all existing geological explorations were consolidated into a permanent Geological Survey, which was organized as a bureau of the Interior Department, and there is little doubt that the practical demonstration of the utility of such work furnished by the Mining Industry volume had much effect in rendering Congress favorable to the new organization. Mr. King, as its first director, in recognition of the legitimacy, in an industrial country like the United States, of a demand for the practical application of geology to the development of its mineral resources, established a division of Mining Geology, and devoted about half of the first year's appropriations to economic studies of mining districts, comprising the Comstock lode, the newly discovered Leadville district of Colorado, and the copper deposits of Lake Superior.

The organic law establishing the Survey had lim-

ited its operations to the National domain, leaving it uncertain whether this meant only the public lands in the West, still belonging to the Government, or the whole area of the United States. Until Congress explicitly authorized the former construction of the law, Mr. King's idea was, by multiplying the surveys of mining districts, which involved the making of special topographic maps for each district, to demonstrate to the mining community the practical usefulness of the work, so that in time the people would demand of their representatives in Congress its extension over the whole country. At the same time he expected that the large corps of observers, trained especially for this work, would accumulate a fund of scientific data with regard to ore deposits from which in time a new and more satisfactory theory of vein-formation could be formulated, and thus confer an even greater benefit upon the mining community.

J. W. Powell, who succeeded Mr. King, accomplished by indirection the construction of the law that Mr. King had failed to obtain directly. The making of a geological map is evidently the first duty of a geological survey, but this had not been explicitly mentioned in the organic law. In the paragraph of the bill making the annual appropriation for the Survey he succeeded in having this clause inserted: "and for making a geological map of the United States," so many dollars. When this had become law, he found himself not only authorized to extend his work over the whole United States, but reasoning that an indispensable preliminary to a geological map is a topographical base, he also felt authorized to have a topographical map of the whole United States constructed. As such a map of the United States would cost at the lowest estimate about \$30,000,000, it would evidently have been of doubtful advisability to ask Congress for it directly. Mr. Powell did not place as much importance on mining geology as did Mr. King, and during his administration, work in this branch rather languished, topography, geology, and irrigation absorbing the greater part of the survey-funds. Nevertheless, during his time Becker accomplished his investigation of the quicksilver deposits, and commenced that of the 'gold belt' of California, in which he was assisted by Waldemar Lindgren, while R. D. Irving and Charles R. Van Hise began the study of the great iron ores of the Northwest.

The Leadville monograph, owing to the peculiar relation of ore deposition to structural geology in that district, had served in a striking manner to illustrate the practical use of applied geology in the working of mines, and had thus served as a great educator of the miner as well as of the mining engineer, and made the work of the Survey popular. Although I was not allotted sufficient funds to undertake during this time the study of other great mining districts on a similar scale, I was able, by reconnaissance-studies, to keep in touch with the more important mining developments throughout the Rocky Mountain region, and by occasional articles in the Transaction of the American Institute of Mining Engineers to keep up the interest of the mining community in the economic work of the Survey, while

*Abstract of address before the Canadian Mining Institute, 1909.

continuing the geological education of the mining engineer. In 1892 the Survey appropriations were cut down a third as the result of an attack made upon the floor of Congress by the Western interests that felt themselves injured by the legislation that had been brought about as a result of the irrigation investigations carried on by Mr. Powell under the auspices of the Survey. Although the men who directed this movement were particularly friendly to the economic branch of the Survey, and had thought to benefit those who were carrying it on, their legislation had exactly the opposite effect, for this provided for the reduction of the number of chief geologists from five to two, but as the law specified no individuals, it fell to the director to designate who should be dropped from the pay-rolls, and his choice fell upon those who had been engaged in economic work. Although we could do no official field work, Mr. Becker and I, however, continued our office work, writing up several reports during the interregnum. With the appointment of Chas. D. Walcott as director in 1894, the economic work of the Survey was revived and given a new lease of life. Not only were we restored to our positions, but we were allowed to recruit the force by the accession of younger men admitted from time to time by competitive examination, so that it came to include the now well known names of F. L. Ransome, J. E. Spurr, W. H. Weed, A. C. Spencer, J. D. Irving, J. M. Boutwell, L. C. Graton, and others. The field of work correspondingly widened, and was later extended to the investigation of the non-metallic minerals under C. W. Hayes, of which, however, I shall not now have time to speak. The accumulation of knowledge under these more favorable conditions has proceeded in a sort of arithmetical progression, so that at the present time there is no important mining district in the country, of whose geological structure the Survey has not some definite knowledge, whether through special or reconnaissance-surveys.

The whole period of investigation forms part of what I have called the period of verification, characterized by attempts to test by practical application to the facts of Nature, theories or hypotheses that had already been proposed, rather than to propound new ones. This was peculiarly true of the first decade when the workers were few and they were entering upon a field of work in which their knowledge was yet to be gained. The first innovation was in extending the methods of detailed surface geological study to the subterranean areas disclosed by the drifts of large numbers of mines. The generalizations first made were those that seemed necessary at the close of each specific piece of work, to show to the miner the conclusions deducible from the geological facts already determined, and the practical bearing they might have upon the conduct of his mining operations. For myself, in my first report (that on Leadville), while drawing conclusions as to what I designated the immediate source of the ores and the manner in which they had been deposited, I specifically disclaimed intention of discussing the ultimate source from which the metals were derived, or of propounding general theories of ore deposition. In the papers, communicated from time to time to the

American Institute of Mining Engineers, I laid stress on the structural relations of the deposits, or the observed facts and generalizations bearing upon the form and nature of the rock channels through which the mineral-laden waters brought in their ores. Reference was also made to other conclusions with a more theoretical basis, which had been criticised as novel and untenable, and which we not only felt bound to defend, but often, as the result of new studies, we wanted to extend in their application. Most prominent among these were those of metasomatism or replacement in the formation of ore deposits, and the genetic connection of ore deposits with eruptive rocks. The former was in those early days regarded as a hobby of mine, because, while all who had occasion to test it in the field were ready to admit that it, rather than cave-filling, was the process by which ores in the limestone were generally deposited, when I maintained, as a result of later studies, that in vein-deposits in the West, a considerable portion of the vein-filling is the replacement of country rock by vein materials, rather than, as had hitherto been held, the filling of pre-existing open spaces, many geologists, including my colleague Mr. Becker, seemed inclined to think I was going too far. That eruptive rocks and ore deposits are commonly associated in Nature, had been remarked by geologists before it was observed by us in the course of our economic studies, but in order to determine whether this connection was genetic, rather than merely a fortuitous association, we endeavored to determine by careful chemical tests whether the fresh unaltered eruptive rocks contain the metals and other materials that went to make up the ore deposits we were studying, following in this the suggestion of Sandberger, who himself had followed that of Bischoff. We were identified to some extent with the 'lateral secretion' school that Sandberger had founded, and were assumed by some of our critics to maintain that the waters we thought had obtained their vein materials from the eruptive rocks, were cold descending waters. In point of fact, however, I by no means believed, as he did, that the vein-materials were necessarily derived from the immediate walls of the deposits, and since I showed that the deposits at Leadville had been formed under a covering of 10,000 ft. of sedimentary beds, it could hardly be said that the waters that formed them were directly descending from the surface. What I did maintain was that if, as the results of our chemical tests seemed to indicate, they were derived from igneous rocks while cooling, it was from such masses as had cooled within a reasonable distance of the place where the deposits were found. My main point of difference with the so-called ascensionists was that they maintained that all ore deposits are formed by waters ascending from the unknown depths or barysphere, where, owing to an assumed greater density the rock masses must be richer in the heavy metals than those observed at the surface, which possess only about half the density of the earth as a whole. Inasmuch, therefore, as these waters were assumed by them, as by all geologists at that time and indeed until the end of the second decade, to be meteoric waters descending under the influence of gravity, to rise again

under the influence of heat, their assumption seemed to involve an evident impossibility. Long before these waters could reach a zone where the rocks had the requisite specific gravity, which must be many miles below the surface, they would reach a region where the pressure would be so great that open cracks which would admit of their circulation would no longer be possible, a condition that Heim in his researches on the mechanics of mountain-building in the Alps had determined would exist at a depth of 5000 metres. It seemed more probable, therefore, that these waters had derived their vein-materials from cooling igneous masses within reasonable proximity to the surface, since chemical tests had proved the actual presence of these materials in some of the fresh rocks tested, whereas similar tests of sedimentary rocks had found none. The chemical tests I depended upon were made by Hillebrand in a laboratory which, under King's authority, I had established in Denver in 1880. In the laboratory which Becker had similarly established in San Francisco, he and Melville had made further investigations in the course of his study of quicksilver deposits, to determine the natural solvents which would have enabled the circulating waters to take up the vein-material that formed part of the rocks they were traversing.

About the middle of the decade the chemists of both these laboratories were transferred to Washington, and the laboratories themselves soon afterward abandoned, so that under the pressure of other work this line of investigations was gradually dropped. Indeed until the studies of petrologists and physical chemists had thrown more definite light on the probable conditions prevailing at some depths beneath the surface, further speculations along this line seemed rather profitless. Finally, in the latter part of the decade, the conclusions arrived at independently by J. P. Iddings in this country and Brøgger in Norway with regard to differentiation in igneous magmas, showing how different varieties of rocks might proceed successively from the same deep-seated molten mass, combined with the discovery that certain titaniferous iron ores in Norway were actual segregations in a cooling magma, seemed to afford a line of argument which was most suggestive, and of which I made use in an article I prepared, during the interregnum, for the Chicago Exposition meeting of the American Institute of Mining Engineers on the 'Geological Distribution of the Useful Metals in the United States'. My line of argument was that since actual proof had thus been afforded that certain metals like iron had been concentrated in given parts of an eruptive magma, the same might be true of the other metals, though it would be less susceptible of proof on account of their smaller proportion among the constituent minerals of rocks. Hence among the different rock-forming magmas that from time to time came to cool within a limited distance of the surface, and thus within reach of the circulation of meteoric waters, it might be conceived that certain magmas, as a result of this process of differentiation, would be rich in gold and silver, others in copper and zinc, or other metals. Thus on the theory that ore deposits are the result of the leaching of bodies of eruptive

rocks, one could understand why one set of deposits contains mainly one combination of metallic minerals and another another, and some regions, where eruptive rocks abound, contain little or none.

Posepny's well known article on ore genesis presented at the same meeting, while it gave an admirable description of the processes involved in ore deposition, and contained the strongest and most definite arguments yet presented in favor of the ascensionist theory, and in disproof of Sandberger's theory of lateral secretion, did not touch upon the difficulties we conceived to stand in its way from the inaccessibility of the barysphere to descending vadose or meteoric waters. He evidently conceived of no other source for the waters circulating within the earth's crust, and was more than insistent in his belief that practically all ore deposits have been deposited from aqueous solution, and are later than the enclosing rocks.

During the second decade my mental attitude toward these more speculative theories was still a waiting one, and I busied myself as before with those more capable of actual proof and of direct practical application to mining. A question of the utmost practical importance to the mining industry and which had often been propounded without receiving satisfactory answer, was whether vein deposits increase or decrease in value with depth, and I was most desirous of obtaining scientific evidence in favor of either conclusion. In the Leadville work it had been recognized already that an enhancement of values takes place in the oxidized zone, in part by removal of the baser and less valuable metals, and in part also by actual transference downward of the silver salts, but this action was supposed to necessarily come to a stop at the ground-water level. In the summer of 1896, during a study of the Butte mines, I discovered definite and unmistakable geological proof that this transference has continued for some distance downward into the zone of unaltered sulphides, thus explaining the formation of bonanzas in the middle depths of many mines, and the frequent prevalence of low-grade ore in depth beyond their reach. Appreciating at once the far-reaching practical importance of this theory of secondary sulphide enrichment, as I called it, I did not wish to publish it until I had satisfied myself as to its general applicability to all classes of deposits, and had discovered a satisfactory explanation of the apparently abnormal chemical reactions involved, which, as pointed out by Mr. King during our frequent discussions of the subject at Butte, formed the weak side of my theory. During several seasons' field work, therefore, I took every opportunity of confirming the operations of this process in other mining districts, making in 1898 a special examination of all the important copper deposits of the West, and finding a remarkable uniformity in the succession of copper minerals with depth that could only be explained on this theory. At Mr. King's suggestion, moreover, I had chemical literature searched for records of reactions that might be supposed to account for the observed mineralogical changes. Some further experimental tests in the Geological Survey laboratory were still desired to be made, when it was

announced that Walter Harvey Weed, who had been associated with me in the Butte survey as surface geologist, was to read a paper on this subject in the winter of 1899-1900. I then learned that, prompted by suggestions gathered during our discussions on the subject at Butte, he had since been making a practical test of the theory himself in certain silver mines of Montana.

At the winter meeting of the American Institute of Mining Engineers there were read, singularly enough, besides the respective papers of Mr. Weed and myself on secondary enrichment, which presented the results of our practical studies in the mines, a more theoretical discussion of 'Some Principles Controlling Deposition of Ores', by Charles R. Van Hise, in which independently, and from a somewhat different point of view, he had arrived at practically the same conclusions with regard to the secondary enrichment of sulphides by descending waters. Mr. Van Hise's article contained an admirable exposition, founded on careful experimental studies, of the manner in which meteoric waters circulate within the crust, and cleared up many points left uncertain by Posepny's earlier explanations, but like him he considered the vast majority of deposits to be epigenetic, and formed through the agency of meteoric waters, practically ignoring, as Mr. Lindgren later pointed out in his article on contact metamorphic deposits, presented at the Richmond meeting of the institute, the important contact deposits of the Kristiania type. It is true that up to 1900 none of us, except possibly Mr. Lindgren himself, had given as much attention as was deserved to this class of deposit. The Kristiania deposits, and indeed most of those in Europe and elsewhere that had been recognized as belonging to the same type, were of little economic importance.

The most decided reaction against the Van Hise-Posepny view presented at the Richmond meeting was contained in James F. Kemp's article on the rôle of igneous rocks in the formation of ore deposits, in which he ascribes the principal rôle not to meteoric waters, as Mr. Van Hise had done, but to waters proceeding from the igneous rocks themselves, hence called magmatic waters. In addition to this forcible theoretical argument in favor of magmatic, rather than meteoric waters, as conveyors of vein-materials, Mr. Kemp quoted several facts of observation showing that the bottom levels of deep mines are generally found to be dry, and hence argued that meteoric waters do not penetrate to depths of over 2000 to 3000 ft., and consequently could not act as conveyors of vein-materials from the depths. Mr. Kemp's contention received unexpected support from an announcement by the great Austrian geologist, Suess, at a Balneological convention at Karlsbad in 1902. In his address Suess stated his belief that the waters of certain thermal springs of Europe which have long been the subject of careful chemical study, are derived not from descending meteoric or vadose waters, but have their source in cooling eruptive magmas, and as they reach the surface for the first time in these springs he denominated them 'juvenile' waters. To this origin he ascribed the vapors poured out by active volcanoes, which had hitherto been supposed to be fed by sea waters percolating downward

through the rocks and meeting the rising lava-stream. Springs then, he classified, by the source of their waters, as juvenile and vadose, and those that are fed in part by waters from both sources. A certain amount of verification of these views is found in the permanence of composition of the springs classed as juvenile, and their independence of variations in the amount of precipitation in the surrounding regions.

Mr. Kemp's views were in the same general line, though a step in advance of the views maintained by the Norwegian geologist, Vogt, who, since 1893, had been advancing a constantly widening applicability of magmatic or pneumatolytic origin to ore deposits, and whose views had been adopted by a number of geologists on this side of the water. Hence Mr. Kemp's article met with very general favor. That among those who are ready to accept the prevailing theory, whatever it may be, for the explanation of the ultimate origin of the deposits they may have occasion to study, this latest explanation has met with such universal acceptance, is hardly surprising. If accepted it removes at once all the objections that have heretofore obtained against either the ascension or lateral-secretion forms of theory. It is a return to the catholic faith of the earlier days, as far as the source of the metals in the unknown depths is concerned, a faith that has been strengthened and rendered more specific by such positive evidence as has been obtained with regard to thermal springs, and the negative evidence of the aridity of such deeper parts of the crusts as have come within the range of direct observation. I will not trespass upon time by discussing the pros and cons of the modern popular theory of the magmatic origin of all ore deposits, with regard to which I can claim no special familiarity. I fully admit its attractiveness as a method of removing the obstacle to deep circulation presented by increase of pressure with depth, since if the *vis a tergo* is sufficient to force up molten lavas across the zone of flowage, the same force ought to suffice for aqueous solutions. One of the points on which I still maintain a doubting position, however, is as to whether we have definite proof that magmas contain enough water to afford the continuous flows needed to supply thermal springs as well as ore deposits. The study of contact metamorphic deposits has afforded some definite proof that certain magmas have given out aqueous solutions (whether in gaseous or liquid form is not essential), that have actually contributed to the surrounding rocks supplies of metallic minerals, but this action was geologically brief, and differs from that involved in affording the continuous supply from great depths predicted by the conditions that obtain in thermal springs, or in the greater accumulations of metallic minerals such, for example, as Leadville and Butte. Before we can assume the sufficiency of this source for subterranean waters we must await further developments from the profound and necessarily deliberate labors in the realms of physical chemistry, such as have been and still are being carried on by F. B. Adams in Montreal, and by Messrs. Becker, Day, and Wright, at Washington, and the results of more such searching geological investigations, as those of Mr. Lindgren, on the contact metamorphic deposits of Clifton-Morenci.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

OIL AND GAS LEASE—CONSTRUCTION.

A written instrument granting all the oil, gas, coal, and asphaltum under certain described land, which was designated a lease, and had a definite term of years and provided for the payment in cash of a stated amount, and also for the payment of a royalty on all oil produced, was construed to be a lease and not a conveyance in fee of the mineral in place.

Moore v. Sawyer, 167 Fed. 826, Jan. '09.

OIL LEASE—PRIORITY.

An assignee of a second oil lease on Indian land, who took the assignment of such lease with knowledge that a prior lease was outstanding, but which had been forwarded to the land office for cancellation at the request of the parties, was not regarded as a bona fide purchaser entitled to preference over such prior lease, where such prior lease was not in fact cancelled, but was approved by the Secretary of the Interior, as the request for cancellation had been made through a mistake, which fact the assignee could have ascertained by making inquiry of the parties.

Moore v. Sawyer, 167 Fed. 826, Jan. '09.

INJURY TO MINER—CONTRIBUTORY NEGLIGENCE.

Where a coal mine was so free from gas that lamps were used, but there was an accumulation of gas in a particular pocket, a miner sent to work in that particular place, and who approached the same with an open light, was not entitled to recover for injuries received by an explosion from gas ignited by his light. Where he knew that there was an accumulation of gas in the particular entry and approached the same with an open light he assumes the risk incident to the service.

Bisko v. Brasnel Coal Co., (Pa.) 72 Atl. 504, Jan. '09.

LOCATION OF MINES—DISCOVERY SHAFT.

Where the original discovery shaft on a lode mining claim was sunk 10 ft. deep, as required by law, and the portion within the boundaries of the claim was large enough to enable a miner to work within the boundaries, the fact that a part of such shaft was in ground operated on an adjacent patented claim was immaterial. The fact that the shaft was partly within the boundaries of another claim was of no consequence where that portion which was within the boundaries of the disputed claim was of such dimensions that it was in reality a shaft sunk upon that ground. The law does not attempt to prescribe the extent of any dimension of the discovery shaft, except the depth.

Nichols v. Williams, (Mont.) 100 Pac. 969, Apr. '09.

JOINT AGREEMENT TO PURCHASE MINING CLAIM—PURCHASE BY ONE AFTER EXPIRATION OF OPTION.

A prospective purchaser contracted with two persons who held an option for a mining concession in Mexico that if they would get an extension of the option in order to give time for the sinking of a shaft he would furnish the necessary money therefor. The holders of the option secured its extension on condition that an advance payment of \$5000 should be made, and demanded payment of the other party of his share of such advance payment, which was refused, and thereupon the holder of the option permitted it to expire. Subsequently one of them immediately obtained a new option to himself under which he afterward purchased the property. In an action by such third person to establish a trust in the property, it was decided that the contract created no such fiduciary relation between the parties as prevented the option holder from treating it as at an end, and that a subsequent purchase by one raised no resulting trust in favor of such prospective purchaser.

Gaines v. Chew, 167 Fed. 630, Feb. '09.

American Mining Congress.

A partial list of the speakers who will appear on the program for the Twelfth Annual Session of the American Mining Congress, at Goldfield, Nevada, September 27 to October 2, appears below. The Program Committee has not yet completed its work, and this list will be materially augmented before the final program is published:

1. Purchasing Coal by the B. T. U. Method: By Samuel A. Taylor.
2. The Paralysis of Mining Districts: By E. B. Kirby.
3. The Forest Reserves and Other Public Land Questions: By Welden B. Heyburn.
4. The New Experimental Ore Dressing and Metallurgical Plant of the Colorado School of Mines: By F. W. Trap-hagen.
5. Industrial Accidents and General Liability Laws: By David Ross.
6. Old Days on the Comstock: By William C. Ralston.
7. State Inspection of Metal Mines: By Courtenay De Kalb.
8. Some Defects in State Inspection of Mines: By Harry A. Lee.
9. Zinc Mines in the Good Springs District: By Douglas White.
10. Geology and Ore Deposits of the Round Mountain District: By J. P. Loftus.
11. Some Grievances of Ore-Producers Against the Smelting Combine: By James H. Fox.
12. The Geology of the Goldfield District: By Charles J. Moore.
13. Some Arizona Suggestions in Mining Law Revision: By Fred J. Elliott.
14. Protecting Mine Investors: By Floyd Davis.
15. The Florence Mine: By A. D. Parker.
16. The Bullfrog Mining District: By Clay Tallman.
17. The Ely Mining District: By S. W. Belford.
18. The Application of Steel to Mining: By R. B. Woodworth.

19. The Effect of Silver Values Upon American Trade with Silver-Standard Countries: By James A. Heckman.
20. A Bureau of Mines: By D. W. Brunton.

Additional views upon the silver question will probably be offered by Moreton Frewen, James J. Hill, and John Hays Hammond. Officials of the Mexican and Canadian Governments are also expected to be present and take part in this discussion.

Special discussions will follow the committee reports upon the following questions:

- The Prevention of Mine Accidents.
- A Tonnage Tax on Coal Output for Distribution Among the Victims of Mine Accidents.
- The Standardization of Electrical Equipment in Mining Work.
- Needed Changes in Alaskan Mining Laws.
- The National Forest Service.
- Vertical Side-Line Laws.
- General Revision of Mining Laws.

Sessions will begin at 10 o'clock Monday morning, September 27, and adjournment will be on Saturday afternoon, October 2. On Wednesday the sessions will be held in Tonopah, the citizens of that city providing a special train to convey the delegates from Goldfield early in the morning, returning in the evening.

Commercial Paragraphs.

THE CANTON BOILER & ENGINEERING CO., Canton, Ohio, has just received an order for a steel stand-pipe, 25 ft. diam. by 100 ft. high, for erection at East Gardner, Massachusetts.

FALKENBURG & LAUCKS, assayers and metallurgists, Seattle, Washington, have issued an instructive, useful pamphlet on the sampling, testing, and specifications of cement. They have added a cement laboratory to their plant.

THE UTAH MINING MACHINERY & SUPPLY CO., Salt Lake City, announces that the name of the concern has been changed to the Galigher Machinery Co. There is no change in the officers or management of the company, but the capitalization has been increased.

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TABLE OF CONTENTS.

| | |
|--|------------------------|
| EDITORIAL: | Page. |
| Notes | 405 |
| Opening New Gold Territory in Peru..... | 406 |
| The Extra-Lateral Right | 406 |
| American Mining Congress | 407 |
| GENERAL MINING NEWS | 409 |
| SPECIAL CORRESPONDENCE | 413 |
| CONCENTRATES | 434 |
| DISCUSSION: | |
| Slag Calculation | G. I. Dinwiddie 420 |
| Cyanide History | |
|Alfred James, Betram Hunt, Alfred Adair | 420 |
| The Commercial Orient | Edward P. North 422 |
| Gases from Explosives and Mine Economy..... | |
|Albion S. Howe | 422 |
| Radium Ore | E. Schaaf-Regelman 422 |
| ARTICLES: | |
| Gold Dredging in Siberia..... | J. B. Landfield 423 |
| Radium Emanation | F. H. Mason 425 |
| Researches Upon Cripple Creek Telluride Ores.... | |
|Thos. B. Crowe | 427 |
| Solution of Kutter's Formula..... | |
|L. I. Hewes and Joseph W. Roe | 429 |
| Photography in Mining..... | T. R. Archbold 431 |
| The Root Positive-Blast Blower..... | L. S. Austin 432 |
| Hornsilver District, Nevada..... | F. L. Ransome 433 |
| American Mining Congress Program..... | 435 |
| DEPARTMENTS: | |
| Personal | 408 |
| Market Reports | 408 |
| Publications Received | 436 |
| Commercial Paragraphs | 436 |

EDITORIAL.

GOLDFIELD claims the greatest gold mine in the world. If necessary two Esquimaux will be produced to swear to it.

THE tariff is proving indeed a work of art, and the can(n)ons of art are the expression of the preference of those interested.

COPPER mining on Prince William Sound, Alaska, is rather quiet now, though development goes steadily forward and shipments are expected this fall.

THE breast of the Newhouse tunnel was advanced 338 feet in August; an excellent record for two-shift work in gneisses and schists. The tunnel is now in nearly 20,000 feet, and is well under the most productive portion of Gilpin county, Colorado.

DIFFICULTIES between China and Japan over railway matters in Manchuria are settled, but the full text of the agreement has not been made public. To commercial interests the important thing is that the Antung-Mukden road is to be improved without delay so that it will become a real transportation route.

THE Geological Survey report upon Goldfield has been issued and makes a handsome appearance. Mr. F. L. Ransome is senior author. He was assisted in the work on the district by Mr. W. H. Emmons and Mr. G. H. Garrey. The report will be especially welcome to the large number of visitors attending the meeting of the Mining Congress.

ACCORDING to the plans carefully worked out in the daily newspapers in this country, the Mexican revolution was to have burst forth in lurid flame on Independence Day, September 16. It has passed off in a most quiet and decorous manner. Likewise the massacre of foreigners in Mexico on September 16, 1906, was accomplished through the newspapers without bloodshed. Meanwhile the building of railroads by the Southern Pacific and the Pearson capitalists proceeds. The great Necaxa dam is continuing under the supervision of Mr. James D. Schuyler, while Mr. John Hays Hammond, in the face of all this revolutionary talk, calmly lays down a small fortune as option-forfeit upon the Santa Gertrudis mine.

COAL miners have been criticising Mr. E. W. Parker's report on the coal production of Alabama because he said that the suspension of work was the result of an effort by the United Mine Workers to strengthen the organization in that State. Since the offending phrase was based on an official letter issued by the International Executive Board of

that organization June 30, 1908, the criticism appeals to us as unfortunate. Much might fairly be said as to the need of Alabama miners for organization and of the unfortunate condition of the particular miners involved. It does not, however, help a lost cause to criticize a public officer for stating facts, particularly when they are so easily verified.

Opening New Gold Territory in Peru.

Announcement is made of a concession granted by the Peruvian Government to the German house of Koppel for a trans-Andine railway, starting from the port of Paita in the northern part of the Republic, passing up the valley of Piura, and crossing the divide approximately at the point where the Amazon, locally termed the Marañón, changes from its northerly course and turns toward the east. This was pointed out by travelers twenty years ago as being the most feasible route across the mountains, the elevation at the summit of the pass being only 7000 feet above tide. This is the lowest depression in the Andes between Popayán, Colombia, and the Paso de los Andes between Cautín, Chile, and the Nequen Territory in Argentine. It is said that with some tunneling the maximum elevation on the Piura route can be reduced to less than 5000 feet. On the west side the line would pass through a region already famous for its oil and sulphur, and for a peculiar long-staple cotton that has for decades commanded double the price of sea-island cotton in the markets of England and the United States. Passing the western range, the road would at once enter the valley of the Amazon in its inter-montane section, which it would follow for about 200 miles, passing the mouths of many rivers already celebrated for rich gold placers. Chief among these is the Utcubamba, which contains a large amount of rich ground, suitable for hydraulicking, as well as areas which will be available for dredging as soon as the railroad may admit of the economical transport of machinery. Farther down the river, just above the great falls of the Amazon, known as the Pongo de Manseriche, the San Lorenzo river empties into the main stream from the north. This river rises near Cuenca in Ecuador, and traverses a great area of schists, filled with small gold-bearing quartz stringers. These afforded alluvial deposits, furnishing rich cream to the early *conquistadores*, nourishing skim-milk to the gold-washers of the last century, and are still yielding whey from which the skilful can extract some pleasant *requeson*. A remarkable feature of the San Lorenzo is the existence of an area of sandstones from which metallic mercury has been contributed to the gold-gravels, resulting in native gold amalgam for many leagues. Below this come other areas of schist yielding gold which has enriched large areas of valley-land near the mouth of the river. The projected railroad will open up a virgin gold region, where both dredging and hydraulic mining will flourish. At present this country is entirely unsettled, except by tribes of untutored savages, and mining concessions could be obtained under favorable conditions. The railroad would terminate at the site of the early abandoned mission town of San Borja, at the foot of the Pongo, to which point steamers drawing five feet of water

can ascend even at low-stage in the river. The eastern range is made up of limestones and sandstones, intruded by diorites and other eruptives. Deposits of iron, copper, and lignite exist, and lead is also reported. It will be seen that the proposed railroad offers a field of great promise to the prospector. This enterprise should be watched by enterprising Americans. At the present moment the easiest access is by way of steamer from New York to Iquitos in the Amazonian Department of Loreto; thence by launch to San Borja; from which point travel is more difficult. Another railroad is being surveyed from the vicinity of Cerro de Pasco, partly for the benefit of the copper industry there established, to deep water on the Amazon river-system. If built, this would also stimulate the development of eastern Peru.

The Extra-Lateral Right.

Discussion upon general revision of the mining law at Goldfield next week will occur at a point where expediency has produced a compromise discarding the extra-lateral right. Thus a concrete example will be presented to the delegates to the Mining Congress highly suggestive of benefits to be derived from a return to the old principle of vertical boundaries for mining claims. In July of last year an agreement was reached between the Goldfield Consolidated and the Jumbo Extension, and others, which it may be useful to re-state. The lode in the Mohawk No. 2 claim dips toward the east, and the Wedge fractional claim, lying adjacent on that side was deeded to the Goldfield Consolidated. This company also owns the Lucky Boy and Clermont claims on the east, which are succeeded in that direction by the Polverde. The right to that portion of the vein lying within the vertical side-lines of the Polverde was conceded to the original locators under agreement with the Goldfield Consolidated to mine and treat the ore on joint-account. No extra-lateral rights were acknowledged beyond the east side-line of the Polverde. The Combination Fraction, by agreement with the Goldfield Consolidated, retains everything within its vertical side-lines, the right to the continuation of the vein beyond the Combination Fraction remaining vested in the Goldfield Consolidated through its ownership of the adjoining Jumbo claim. A similar arrangement applied to the Vinegorone, but the rights of the Goldfield Consolidated were recognized as continuing on the dip of the vein beyond the Vinegorone under the Laguna. The consolidation of the Mohawk and the Combination was also in part a result of the perils of legal contest over extra-lateral rights. The January claim, lying on the west side of the Combination No. 1 was purchased by the owners of the Mohawk on the chance that Mohawk orebodies might apex on that ground. The general expectation was, however, that the Combination vein would lead into the Mohawk deposit when followed to that depth. The owners of the Combination evidently relied on that assumption, and a battle royal was anticipated. At that juncture a technical weakness was discovered in the case of the Combination, a single discovery point and monument applying to Combination No. 1 and 2 claims. The application for patent to these claims was thereupon ad-

versed by the other side to the controversy, and the result was a consolidation on terms which in the end have proved exceedingly advantageous for the owners of the Combination. The danger lurking in the extra-lateral right was a powerful lever, but only one lever, in effecting this famous compromise.

A spirit of conciliation likewise led to disregard of the extra-lateral principle at Tonopah, where the West End Consolidated and the McNamara Mining companies adjusted their differences last year by acceptance of vertical side-line limitations. Within six months recognition of the inapplicability of existing law to large masses where nothing exists corresponding to the fissure vein on which the theory of the extra-lateral right is founded, has brought the Nevada Consolidated, the Giroux, and the Cumberland-Ely into harmonious compromise. The extra-lateral right was also discarded at Bisbee, Arizona, for similar reasons. The plain teaching of these examples is that self interest determines whether it be better business policy to fight or to compromise. Abolition of the law as it now stands would provoke new difficulties and lead to a sudden increase in litigation. The rights of a locator under the new law would necessarily be subject to the rights of locators under the old, and the courts would be overwhelmed with suits and petitions for injunction brought by claimants under the Act of 1872. While conceding that the extra-lateral principle has only a limited application, and should not have been introduced, it has stood so long that to set it aside would seem fraught with peril to the economic progress of the mining camps of the West. It seems doubtful whether the immediate influence upon prosperity would not be so detrimental as to offset any ultimate advantage that might accrue.

The American Mining Congress.

The American Mining Congress, which assembles Monday at Goldfield for its twelfth annual session, has, after a somewhat checkered career, become a body of not inconsiderable influence and usefulness. It started, as have many other good things in American mining, in Gilpin county, Colorado. At the height of the agitation for free coinage of silver, certain Gilpin county mining men decided it would be just as well to remind the world of the importance of gold as well as silver. Through their instrumentality a call was issued for a 'Gold Mining Convention'. Alas, however, for human hopes and plans! When the delegates assembled at Denver they hardly awaited organization before introducing and passing the standard free-coinage resolution with which it was then customary to open everything from *kneipes* to prayer-meetings. At this the Gilpin county delegation, sadly ruffled as to feelings, walked sedately down the aisle and out. The Congress, thus deserted by its parents, was left to its fate—a fate which has proved varied and interesting. At first, as the 'International Mining Congress', it was largely an organization used to boom the mining districts in which it successively met. Later, following a narrow escape from capture by the Western Federation of Miners, a group of the more representative members re-organized it as the American Mining Congress.

Certain of the old crowd separated themselves from the organization, and others were separated. A permanent secretary, Mr. J. F. Callbreath, Jr., a lawyer and an owner of mines in Summit county, Colorado, was elected, a paid membership was provided, and new men elected on the Board of Directors.

Under the new organization the Congress, while still small, has grown greatly in character and influence. It has always been a strangely heterogeneous organization, but by that very reason has been the more representative. It has been held together by a small group of men, headed by Mr. J. H. Richards, that has worked hard and unselfishly to keep it alive as a forum for the debate of all public questions relating to mining; a meeting open to all. It may be noted that while many cranks have been allowed to relieve their feelings by introducing resolutions and by making resounding and eloquent speeches, the sober sense of the organization has always prevailed. It is one thing to introduce a resolution and quite another and different thing to get it passed. As a result, the resolutions really mean something, and will repay the careful attention always of any thinking man interested in the mining industry.

The Congress has taken an active part in campaigns against fraudulent mine promotion, in favor of a Federal Bureau of Mines, greater uniformity in mining laws, and a number of equally important movements. It has promoted acquaintance and co-operation among mining men and has been an important influence in educating the public and in formulating public opinion. Yet the organization is far from occupying the position of prominence and influence which its name connotes. It has never become truly national, and while the quality of the membership has constantly improved, it must be frankly recognized that many of the best men connected with mining have constantly stood aloof. If the Congress is to fulfil its mission, and its meetings are to become great annual gatherings where all phases of mining in its relation to the public and to the State and National Government are threshed out, it must secure the support of more of the men prominent in mining, and particularly of the mining engineers. It must have men of national prominence as officers. An excellent suggestion has been made to the effect that Mr. James Douglas be elected president. This would be an eminently fitting selection, as there is no man who stands more exactly for the ideals which the Congress is striving to realize. His election would dignify the Congress, and the establishment of the organization in the larger national confidence would be an especially worthy piece of public service for our eminently useful and public spirited fellow citizen. Mr. J. H. Richards, who now holds the office, has given seven years of singularly disinterested and able service to the work. It is an open secret that he has long wished to retire, and it is hoped that it may be possible for him to do so at this time. Others of the officers will doubtless drop out at the same time. They deserve great credit for the work they have done, but change is inevitable. We believe the American Mining Congress can be immensely useful to the Nation and our good wishes go out to it and its officers.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

S. H. BALL is in Chicago.
H. C. HOOVER is in New York.
F. B. VAN HORN has been in San Francisco.
C. T. DOZIER has gone to Shasta county, California.
OWEN JOHNSON is returning from England to Colorado.
LOUIS FALKENAU has recovered from a severe sickness.
F. LYNWOOD GARRISON has gone to Mexico for a month.
W. F. A. THOMAS has returned to London from Portugal.
HOWARD D. SMITH has sailed from New York for England.
M. K. SHALEB returned from Central Africa September 15.
EDWARD V. D'INVILLIERS has been visiting Pacific Coast cities.

W. R. FELDTMANN left London for West Africa on September 25.

FRANK ANDERSON, of Salt Lake, is in southern Idaho at present.

JUAN FELIX BRANDES has gone to Mexico City and Parral, Mexico.

RUSH M. HESS has returned from Ecuador and is at Reno, Nevada.

S. F. SHAW will be in Costa Rica during October and November.

GEORGE D. REID, of Denver, is in the Seven Devils region of Idaho.

W. H. EMMONS will be at the University of Chicago after October 1.

F. W. BRADLEY has returned to San Francisco from Idaho and Alaska.

O. H. JONES, of the El Tigre mine, Sonora, Mexico, is in Los Angeles.

BENJ. F. TIBBY has opened an office in the Newhouse building, Salt Lake.

E. A. MANNHEIM, of Griffiths, Mannheim & Co., is now at Laveras, in Brazil.

J. M. CALLOW, of Salt Lake, is spending a brief time on the Hawaiian Islands.

CHAS. A. PORTER has located in Salt Lake, having opened an office in the Atlas block.

AUGUST MATTEZ has returned to New York from an extended trip through the West.

CHARLES BUTTERS is expected in New York October 3 on his way from London to San Francisco.

E. S. KING has gone to Wiluna, West Australia, on his appointment as manager for the Gwall Consolidated mine.

J. S. FREE and E. A. Taylor, engineers and mine operators, have opened offices in Salt Lake, Utah, and Pioche, Nevada.

ROBERT HAWXHURST, Jr., has resigned the management of the Poderosa Mining Co., Ltd., and is on his way to London.

NORMAN G. CORSON, formerly of Creede, Colorado, has purchased the assay office and business of J. A. Pack, Boise, Idaho.

WILLIAM WELLS ELMER has resumed practice as a consulting and mining engineer with offices at Coneto, Durango, Mexico.

W. D. B. MOTTER, Jr., has accepted a position as mining engineer for M. A. Hanna & Co., in the Crystal Falls district of Michigan.

JOHN CRAIG, a graduate of the University of California, now manager of the Simmer & Knights Deep of Johannesburg, is in San Francisco.

WILFRED B. WAINWRIGHT, managing director for the Borax Properties, Ltd., of California, has returned to Los Angeles from a trip to New York City.

E. R. BUCKLEY, with the Federal Lead Co., Flat River, Missouri, spent a week in Utah prior to attending the Mining Congress at Goldfield, Nevada.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, September 23.

| | | | |
|--------------------------|------------|--------------------------|-------------|
| Antimony | 12-12½c | Quicksilver (flask)..... | 43.50-44.50 |
| Electrolytic Copper..... | 15¼-16¼c | Spelter | 7-7¼c |
| Pig Lead..... | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|---------------|-------------------------|-------|----------|--------------------|
| Sept. 17..... | 12.87 | 4.21 | 5.76 | 51½ |
| " 18..... | 12.87 | 4.21 | 5.76 | 51½ |
| " 19..... | Sunday. No market. | | | |
| " 20..... | 12.87 | 4.21 | 5.78 | 51½ |
| " 21..... | 12.87 | 4.21 | 5.81 | 51½ |
| " 22..... | 12.87 | 4.21 | 5.83 | 51½ |
| " 23..... | 12.87 | 4.21 | 5.83 | 51½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Sept. 16. £ s. d. | Sept. 23. £ s. d. |
|------------------------|----------------------|----------------------|
| Camp Bird..... | 1 9 9 | 1 8 6 |
| El Oro..... | 1 5 6 | 1 5 6 |
| Esperanza..... | 2 18 6 | 3 0 0 |
| Dolores..... | 1 10 0 | 1 10 0 |
| Oroville Dredging..... | 0 12 6 | 0 14 0 |
| Mexico Mines..... | 6 6 3 | 6 10 0 |
| Tomboy..... | 1 0 7½ | 1 0 7½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

Closing Prices.

| | Sept. 16. | Sept. 23. |
|--------------------------------------|-----------|-----------|
| Amalgamated Copper..... | 83¼ | 82¾ |
| American Smelting & Refining Co..... | 99¾ | 99¾ |
| Boston Copper..... | 14¾ | 14¾ |
| Butte Coalition..... | 25 | 25½ |
| Cumberland-Ely..... | 7½ | 7¼ |
| Dolores..... | 6 | — |
| El Rayo..... | 2¾ | — |
| Giroux..... | 9½ | 9½ |
| Greene-Cananea..... | 9¾ | 9¾ |
| Indiana Sonora..... | 3 | — |
| La Rose..... | 7½ | — |
| Miami Copper..... | 16 | 16 |
| Nevada Consolidated..... | 24¾ | 28¾ |
| Newhouse..... | 2¾ | — |
| Nipissing..... | 10½ | 12¼ |
| Ohio Copper..... | 4½ | 4½ |
| Tennessee Copper..... | 37 | — |
| Utah Copper..... | 50 | 49¾ |
| Yukon..... | 5½ | 5¼ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.
September 23.

Closing Prices.
September 23.

| | | | |
|--------------------------|-----|---------------------------|-----|
| Adventure..... | 6½ | Mohawk..... | 62 |
| Allouez..... | 59 | North Butte..... | 62 |
| Atlantic..... | 8¾ | Old Dominion..... | 64¾ |
| Calumet & Arizona..... | 104 | Osceola..... | 145 |
| Calumet & Hecla..... | 675 | Parrot..... | 31½ |
| Centennial..... | 40½ | Santa Fe..... | 2 |
| Copper Range..... | 81½ | Shannon..... | 15¾ |
| Daly-West..... | 8 | Superior & Pittsburg..... | 15½ |
| Franklin..... | 17 | Tamarack..... | 71 |
| Granby..... | 100 | Trinity..... | 12¼ |
| Greene-Cananea, ctf..... | 9¼ | Utah Con..... | 44¾ |
| Isle Royale..... | 23¾ | Victoria..... | 4 |
| La Salle..... | 16 | Winona..... | 7½ |
| Mass..... | 8 | Wolverine..... | 162 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 23.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 13 | Midway..... | \$ 20 |
| Belmont..... | 80 | Montana Tonopah..... | 1.05 |
| Booth..... | 13 | Nevada Hills..... | 80 |
| Columbia Mtn..... | 10 | Ophir (Comstock)..... | 1.15 |
| Combination Fraction..... | 73 | Pittsburg Silver Peak..... | 51 |
| Dalay..... | 14 | Rawhide Coalition..... | 25 |
| Florence..... | 2.90 | Rayhide Queen..... | 25 |
| Goldfield Con..... | 7.00 | Round Mountain..... | 65 |
| Gold Keweenaw..... | 9 | Sandstorm..... | 9 |
| Great Bend..... | 11 | Silver Pick..... | 14 |
| Jim Butler..... | 12 | St. Ives..... | 9 |
| Jumbo Extension..... | 16 | Tonopah Extension..... | 61 |
| MacNamara..... | 32 | Tonopah of Nevada..... | 7.00 |
| Mayflower..... | 14 | West End..... | 30 |

General Mining News.

ALASKA.

W. H. Heath, of Spokane, has taken eight men to Alaska to develop a group of 20 claims on Willow creek. The company represented by Mr. Heath has been prospecting the claims for two years and has obtained assays as high as \$22,000 per ton from the ore.—The Alaska Mines Exploration Co. has been incorporated in Spokane to develop properties in the Cook Inlet country.

ARIZONA.

COCHISE COUNTY.

A number of the most influential stock holders of the Bunker Hill mine at Tombstone have visited the property lately, and it is understood that operations are to be resumed in the near future.—The north cross-cut from the 120-ft. level of the Doran & Gallagher property opened a body of sulphide ore, picked samples of which assayed 15% copper.

GILA COUNTY.

The Duquesne Mining Co. is erecting a surface plant and living accommodations for the men at its property in Gold gulch, 15 miles from Globe. The company has graded a wagon-road to the Castle Dome road and will commence sinking some time in October. John F. Shaw is in charge of the work.—The new compressor at the Hamilton shaft of the Cactus Development Co. has been started and the drifts are now being run with machine-drills. The company expects to have the Pinto shaft completed to the 541-ft. level by the end of October, when a connection will be made with the Hamilton shaft.—The cross-cut on the 200-ft. level of the vertical shaft at the Live Oak property in the Miami district is in 3% copper ore, and on the 300-ft. level the face is in ore averaging 2.75%. The ore is largely chalcocite.—The Williams shaft at the Iron Cap property of the National Mining Exploration Co. is down 200 ft. The company has installed a compressor and machine-drills and will sink to the 500-ft. level and cross-cut the orebody.—A new compressor and machine-drills have been installed at the shaft of the Superior & Globe Copper Co. It was the intention of the company to cross-cut at the 500-ft. level, but the showing has not been as expected, so the shaft will be sunk another 100 ft. before the lateral work is started.—The Lost Gulch Mines Co. has purchased the machinery for a 10-stamp mill. J. T. Harrington is manager.—The smelter of the Arizona Commercial Copper Co. is nearly complete and will be blown-in in the early part of October.—The Gibson Copper Co. is shipping 10 tons of high-grade ore per day to the Old Dominion smelter. The company has let a contract to W. C. Newlands to timber 60 ft. in the main adit with concrete sets. A short time ago the Copper Queen company tried concrete, but the experiment proved unsuccessful and the concrete was replaced by wood. The Gibson adit is in ground that is hard to hold, so the concrete will receive a good test.

MOHAVE COUNTY.

(Special Correspondence).—The shaft on the Carter mine, situated in Red Gap district, has reached a depth of 145 ft. A new compressor and machine-drills have been installed. These are working satisfactorily.—Reports from Acme say that the adit being run to cut the Red Top mine, on the Gold Road mine, has passed through the hanging-wall and is now in good ore. The adit is in 250 ft., with a vertical depth of 130 ft.—The Mohave Silver Mining Co., whose properties are situated at White Hills, is preparing to do a large amount of work during the remainder of the fall months and ensuing winter. The company owns the McKesson group of mines and claims which have had a large amount of work done on them, paying well for the amount of money expended.—The adit on the Ruth property, situated in Gold Basin district, is being driven at the rate of 4 ft. per day in good milling ore. A steam hoist is in transit. The initial shaft is to be sunk to a depth of 500 feet. Kingman, September 20.

The road to the Golconda mine was badly damaged by

the recent rains, but is now being repaired and the company is preparing to ship 40 tons of ore that averages 50% zinc.—A station has been cut at the 200-ft. level of the Holy Moses mine and a cross-cut started toward the vein.—The first clean-up of the new mill on the Last Chance property at Wallapai Springs resulted in a saving of \$25 per ton. The company expects to install concentrators and a heavier power plant.—S. R. Porter and C. H. Scheu have secured an option on the old Keystone mine in the Wallapai district. A diamond-drill will be installed and the ground thoroughly explored before any extensive underground work is undertaken.

SANTA CRUZ COUNTY.

(Special Correspondence).—Two hundred and sixty tons of ore have been shipped from the Augusta mine, Patagonia district, to the smelter at Globe since the first of the month. Recent rains and cloudbursts have greatly damaged the roads between the mine and railroad, and sometime will elapse before repairs can be made.

Nogales, September 20.

YAVAPAI COUNTY.

(Special Correspondence).—The old Vulture mine, situated 15 miles south of Wickenburg, is opened to the 600-ft. level. On the 450-ft. level a great deal of cross-cutting and driving has been done, and the average of 29 samples of ore from the main vein gave assays of \$9.60 per ton. The mineralized dike at the mine is more than 175 ft. wide, and at the contact of this dike occur lenses of quartz which contains the gold. The mine produced \$16,000,000 from former working.

Phoenix, September 18.

The New England-Arizona Mining Co. has ordered a new hoist for its mine in the Big Bug district. Cross-cutting is now in progress on the 600-ft. level, but as soon as the new hoist can be installed, the shaft will be sunk to the 700, and the vein opened there. J. H. Farrell is manager.—The cross-cut from the 200-ft. level of the Black mountain property, seven miles east of Jerome Junction, is in 115 ft. A slight delay was caused by the breaking of the pump in the shaft. F. A. Reislings is superintendent.—The dam and machinery of the Speck Dredging Co., on Lynk creek, were damaged by the high water caused by a cloudburst.

YUMA COUNTY.

(Special Correspondence).—J. A. Cronkhite, superintendent of the Alvin Development Co., at Salome, reports that the shaft is now down more than 100 ft., with 70 ft. of cross-cutting, in gold and copper ores of good grade.

Yuma, September 27.

CALIFORNIA.

NEVADA COUNTY.

A 2½-ft. vein has been cut on the 900-ft. level of the New York-Grass Valley mine. The mine has been idle for over a year though the pumps have been kept going to keep the mine from flooding. A. P. Wilson, who has been in charge of the property, started a cross-cut to find the vein which had been lost and had only gone a few feet when the quartz was cut.—The Eureka mine, adjoining the Idaho-Maryland property, has been sold by Robert Morrow to McCredie, Tilton and McDonnell, of Oakland, for \$50,000. The mine has been idle for a long time, the owners refusing to accept any terms except a cash sale.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The Needles smelter has suspended operation because of the alleged lack of ore. Stockholders state that the plant will resume at an early date, but there are several rumors concerning the company that indicates the shut-down may be of long duration. It is known that the owners have been anxious to dispose of the plant.—A 32-in. vein of \$83 silver ore has been opened on the Easton group, in the Silver Lake district.—It is reported that a 19-in. shoot of ore, running from \$200 to \$2000 per ton, has been struck at a depth of 600 ft. in the Blue Bucket. A number of small, rich shoots are being opened by cross-cuts in the lower workings.—W. A. Clark, Jr., and associates have decided to resume operations on their holdings near Klienfelder. The 100-ft. shaft has opened

large bodies of ore, with copper predominating. A 50-hp. hoist, compressor, air-drills, etc., have been ordered and the shaft will be sunk to the 1000-ft. level.—The shaft at the California Hills is down 300 ft. Some good ore was recently opened.—The Ibex has been re-organized under the name of the Gold Bank by Mr. Ferguson, of Long Beach. A 5-ft. Huntington mill, with a capacity of 35 tons per day, has been purchased, and work will be resumed at an early date.—Clausen & Ware have sold their holdings at Gold Flat to Pasadena capitalists for \$20,000. The group has been opened by a 125-ft. shaft. Development will be started immediately with C. M. Lamb in charge of the work.—The Leiser-Ray Mining Co. has installed a 50-ton crushing and leaching plant at the Homer mine.—J. F. Main has opened a body of ore running \$5 to \$500 per ton in gold and tungsten on his Signal property.—A large deposit of China clay has been discovered near Klienfelder by D. E. De Lape. A force of men will be put to work at once.—The Lucile Gold & Copper Mining Co. has opened a large vein of milling ore. It has been exposed for 300 ft., and averages \$8 per ton. Orders have been placed for a small stamp-mill.—Davis & Helgersen have bonded the Washington claim.—A 300-ft. deposit of ore, said to run 4% copper and \$10 gold, has been opened on the surface for a considerable distance by Dillon, Howard & Kelly at Lone Willow spring.—A high-grade body of silver ore has been opened in the Iris claim. Shipping will commence within a few weeks.—The Koch group reports the uncovering of a small vein assaying 22% copper and \$60 gold.—The Custom mill, at Victorville, has resumed operations and is treating 15 tons of ore per day.—At the Wild Rose the shaft is down 75 ft. on a vein of high-grade ore.—Two large veins, running from \$8 to \$25 per ton, have been opened on the Guarantee Mining & Development group. The main shaft is down 150 ft., and the 5-stamp mill is running steadily.—The Morse-Kayser Mining Co. has completed a 5-stamp mill at its property near Victorville.—The Big Chief Mining Co. has secured a bond on the Jumbo, Good Luck, Clapper, Clapper No. 2, and Clapper No. 3 mining claims at Hart. The bond runs for one year and is for \$75,000 to be made in monthly payments, the final one being \$40,250. A compressor and machine-drills will be installed at once and a mill built on the property at a later date.

San Bernardino, September 20.

SHASTA COUNTY.

The Delta Consolidated Gold Mining Co. filed suit against the Inca Treasure Gold Mining Co., charging M. E. Dittmar, Sherman T. White, Edward Sanders and Martin Hveem with misuse of their powers as officers in purchasing the Pioneer Black Oak mines, which they knew were worthless at the time of the purchase. The company is erecting ore-bins at Delta and has commenced shipping ore.—The Mammoth Copper Mining Co. is to resume the treatment of flue-dust in its Kennett smelter. For the past six months this has been sent to the Balaklala plant at Coram. The fine is shipped to the Peyton Chemical Co., at Martinez.—Over 200 members enrolled at a recent meeting of the Shasta County Farmers' Protective Association, and voted to allow the smelting companies until November 1 to take some definite action in reducing the smelter fume.—It appears that the dredge of the United States Gold Dredging Co., on Middle creek, did not sink because of the failure of the hull, but because the extra machinery caused the dredge to lie so deep that water came into the seams which were dried out. The hull gradually filled up until the water came over the deck and poured in the open hatches. Curiously this condition was not discovered until the dredge started to sink. The dredge is now being pumped out and it is found that but small damage has been done to the hull. The remodelled dredge is fitted with standard Risdon machinery, and the company officials are sanguine as to future prospects.

SIERRA COUNTY.

A drift has been run 140 ft. on the vein at the Twenty-One mine near Alleghany. The ore contains considerable quantities of sulphides as well as free gold.—A recent

test of the gravel at the Omega mine, near Forest, resulted in a clean-up of \$10 per car.—E. J. Morgan, of Nevada City, has secured a bond on the General Sherman property near Alleghany.—The Voyle Brothers are to install a 3-stamp mill, driven by a gasoline engine, at the Oakland mine.

SISKIYOU COUNTY.

On a recent run of the Kradle and Newcome mill at Oro Fino the clean-up amounted to \$20 per ton. There is considerable ore stored on the dump for another run.—The clean-up on a run of 15 tons of ore from the Oom Paul mine of McChoncie & Kirk resulted in a 45-oz. gold-bar.—New pumps have been installed and work resumed at the Shelba mine which was recently closed down on account of the heavy flow of water.—Owing to the lack of water the Gardener & Weed mine, in Quartz valley, has been closed down for the season. The last clean-up was excellent and the mine will be put in order to resume operations with the first rains of the season.

TRINITY COUNTY.

At the La Grange hydraulic mine the company is building additional living quarters for the men and repairing the ditch for the fall work.—The company operating the Headlight mine, near Carrville, has purchased the Jumper & Morris sawmill and moved it to the property. The company is building a new 40-stamp mill and chlorination plant. The vein is 40 ft. wide and runs between \$4 and \$5 per ton.

TUOLUMNE COUNTY.

The vein recently discovered by W. C. Fuller on Knights creek, north of Sonora, has been stripped for 50 ft. showing free gold the entire distance.—The clean-up on a trial run of 50 tons from the Knox & Boyle property amounted to \$2500.—The mill at the Harvard mine is again in operation.—The winze at the Hancock is down 50 ft. on a 20-in. vein that assays \$25 per ton.—The Rough and Ready placer mine, at Mountain Pass, has been bonded and will be operated this winter.—A car and rails have been shipped to the Jumper mine, near Jamestown, and it is understood that work will be resumed at this property in the near future.—The clean-up at the Ida Kline amounted to \$1500 last week.—It is the intention of the Atlas Mining Co. to erect a mill on its mine on Jackass hill. Previous to this the ore has been crushed in the Street mill in Tuttle-town.—The mill at the Yrma mine is to crush 2000 tons of ore to test its value.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A rich find has just been made at the Conqueror mine, situated on Covode mountain. The discovery was made 900 ft. from the entrance of the adit. A streak of smelting ore that is 2 ft. wide has been cut. The ore assays 5 oz. gold per ton, and the ground is being opened preparatory to stoping. The 50-ton mill is running night and day and a heavy tonnage of concentrate shipped. W. S. Pryor is manager.—A 8-in. streak of lead ore was uncovered on the Homestake property that assays \$44 per ton gold, silver, lead and copper. The adit has been advanced over 400 ft., and now that the Homestake vein has been cut, drifts will be started east and west. Jos. Trudeau is manager.—David Kennedy, manager of the Centennial mine, returned last week from Boston, where he had been in consultation with the directors of the company regarding future development. It is stated that work will be put under way some time during the present month in the construction of the new stamp-mill which is to have a capacity of 50 tons per day. In the meantime a force of men is being employed in blocking out the ore-reserves in order that ample material may be available to insure a steady run.—A streak of ore 8 in. wide has been cut in the heading of the Capital adit at a depth of 2200 ft. The ore assays 5 oz. gold and 30 oz. silver to the ton with 7% copper. W. M. Cooper is manager.—H. A. Shipman visited the property of the Golden Glory T. & M. Co. last week and after examination instructed J. L. Young, the

superintendent, to proceed with the advance of the adit, which is now in 600 ft. The first vein to be reached is the extension of the Bellevue-Hudson.—Work will be started shortly at the Kelly adit on Democrat mountain. Advice received from D. H. O. Marcy, of Boston, are to the effect that the financial end has been provided for and that the big bore, now in 2800 ft., will be advanced at least 5000 ft. A number of contracts have been signed by owners of mines which lie along the course of the adit. B. F. Kelly, the originator of the plan, will serve as the manager for the new company.—The Newhouse adit was advanced during the month of August 338 ft., making the total distance driven 19,890 ft.—The Hedenburg mine, situated in Spring gulch, is being re-opened. Drifts have been started on a streak of smelting ore that is 10 in. wide, and assays \$36 per ton gold and silver.—Work on a large scale was put under way last week on the Rockford adit, situated on Donaldson mountain. The drifts on the Donaldson and Magnolia veins are also to be extended and the ore is being blocked out preparatory to the blowing in of the pyritic smelter at Golden, which was recently purchased by the North American Mines & Smelter Co. The old Kilton sampler is now undergoing repairs and will be put into commission shortly. A number of operators have signified their intention of shipping to this plant.

Georgetown, September 20.

OURAY COUNTY.

The east drift on the Klondike vein from the Atlas workings opened a rich shoot of ruby silver with a considerable copper content.—The raise from the lower adit of the Thistledown property is within 200 ft. of the old workings. The work has been in ore the entire distance and the shoot is thought to be the one worked in former years.—The Ouray Commercial Club shipped a large number of 25-lb. samples of Ouray county ores to the Colorado Interstate fair which was held in Denver.—The new hoist is running at the Legal Tender mine and the work of sinking to the contact started.—At the San Antonio mine, on Red mountain, the Carbon Lake shaft has been sunk 200 ft. on a body of copper ore, and the Koehler adit driven to cut the vein 350 ft. below the bottom of the shaft.—A large body of lead-copper-silver ore has been opened at the Senator Beck mine by E. C. Mattes.

SUMMIT COUNTY.

The Summit County Power Co. completed the installation of an electric plant at the Pennsylvania mine and both mine and mill will be operated by electricity. W. B. Le Wald is in charge of the work.—The main adit at the King Solomon property is in over 3000 ft., and should open several veins in a short distance. On the No. 2 vein the east drift is following a streak of copper ore and on No. 4 the raise is in ore that assays \$42 per ton.

TELLER COUNTY.

C. E. Meisee has secured an 18 months' lease on the Hannah Britt mine from the United Gold Mines Co. The mine contains large low-grade orebodies, the product from which will be treated at the Wild Horse and Golden Cycle mills.—The Trilby Mines Co. has started its new mill on ore from the Trilby and Ben Harrison mines. The mill is operated by electric power and has a capacity of 75 tons per day. The management will continue to ship the high-grade ore but all that mined from the large oxidized orebodies will be treated in the mill to which a cyanide annex will be added shortly. The annual meeting of the stockholders will be held in Cripple Creek in October.—The Atlantic Mines Corporation has leased the Santa Rita mine, on Squaw mountain, to Daniel Mahoney. The mine is equipped with a good plant and work will be started at once on the main Santa Rita vein north of the shaft.—S. Sindlinger has installed an electric hoist at the Lonaconing shaft which he is operating under lease from the El Paso company. A new shoot has been opened on the Lonaconing vein that assays \$40 per ton.—The dump of the Old Gold Mines Co., on Bacon hill, has been leased and a rotary washer installed. The ore will be washed and screened and the fine shipped to one of the valley plants.

—The Clements Mining & Leasing Co. is installing a new hoist and power plant at the shaft on the property of the Gold Sovereign Mining & Tunnel Co., on Bull hill, which it is operating under lease.

IDAHO.

ADA COUNTY.

The Whitman mine, at Pearl, in charge of Wm. H. Hutchings, is mining and milling about 20 tons of ore per day, and shipping concentrate.

ELMORE COUNTY.

(Special Correspondence).—The mine and mill of the Bagdad-Chase Mining Co., in the Atlanta district, are in operation, under the superintendency of F. W. Bewely. The mill has 40 stamps, Frue and Johnson vanners, two Allis-Chalmers tube-mills, a roasting-furnace and cyanide plant, treating 150 tons of ore per day. The pulp passes from the mortars through 20-mesh screens, over amalgamating plates on which a 40% extraction is made. The plate-tailing, containing iron and arsenopyrite that contains gold, is then classified and concentrated, the coarser concentrate being re-ground to 100-mesh in the tube-mills. The tube-mill product and the finer vanner concentrate are then run together and given an oxidizing roast, after which they are cyanided, the result being an extraction of 90% of the gold in the concentrate, or 50% of the value of the ore. The ore runs \$5 gold per ton, and 50 to 75c. silver. It is stated that the cost of mining and milling is \$2.44 per ton. The ore occurs in a wide lode, in granite, and the walls are not well defined. The mining is done by hand-drilling, the ore being conveyed to the mill by an aerial tramway. The mill machinery is operated by electric power, generated at the company's plant on the Boise river. A passable wagon road has been made from Boise, up the river of that name, to Atlanta, a distance of about 85 miles, though most of the hauling to the camp is from Mountain Home via Pine and Rocky Bar.

Atlanta, September 18.

IDAHO COUNTY.

The contract for driving 100 ft. on the vein at the Gold Bullion mine has been completed and another contract will be let as the drift was not driven far enough to tap the ore-shoot.—Machinery for the dredges on Elk creek and the American river is being freighted through Elk City. It is expected that the dredging will be started about the middle of October.—Arrangements have been made for further development work at the property of the Umatilla Mining Co. Orrin Lamb is superintendent.—At the Buster mine the cross-cut from No. 2 adit opened several stringers of ore.—The engineers of the Northern Pacific railroad are surveying a line from Stites through Harpster to Elk City.

MONTANA.

MISSOULA COUNTY.

A drift is being driven on the vein of the True Fissure Mining Co., near Saltese, that will give 1000 ft. of backs. Over \$35,000 has been spent on the property and a large amount of ore blocked out. John Lefevre is manager.—There are 75 men working in the Success mine and mill, near Nine Mile, and the company expects to increase the force to 100 in a short time. Regular shipments of concentrate are being forwarded to the smelter and when the force is increased the company will ship 1200 tons per month.—The adit of the Iron Mountain Mining Co., near Superior, cut a 6-ft. vein of zinc ore. A stope has been opened and the company is preparing to ship to the reduction works at Columbus. Over \$500,000 dividends have been paid from shipments of lead-silver ore from a parallel vein.

SILVER BOW COUNTY.

(Special Correspondence).—The steel ore bins of the Butte-Ballaklava Copper Co. have been completed and the company will begin regular shipments of ore during the coming week. The body of bornite, 35% copper ore, on the 1300-ft. level, still continues in the drift and has now been blocked out for 120 ft., widening and showing indica-

tions of continuing to great length and depth. About the first of October the company will begin raising the third compartment of the shaft from the 500-ft. level to the surface. Until that compartment is completed the production of ore will necessarily be limited, as raising will interfere somewhat with mining, but there will be no cessation and about 100 tons per day will be hoisted. When the shaft is completed the output will be materially increased, the mine being in condition to yield at least 300 tons per day.—It is expected that work on the new zinc concentrator of the Butte & Superior company will begin shortly and that it will be completed in about three months. It will have a capacity of 300 tons per day to start with, and if it proves successful, it will be enlarged. The owner of the zinc process will erect the mill and purchase the ore from the Butte & Superior company, but giving the company a contract or option to purchase the mill if it works all right. The Butte & Superior had been shipping some of its ore to the concentrator at the Butte Reduction Works, owned by W. A. Clark, but after Clark's Elm Orlu mine became able to supply all the ore the concentrator could handle, the Butte & Superior was shut off. As the Butte & Superior concentrate is of an especially high-grade and much sought by zinc smelters, the company determined to have a concentrator for its exclusive use built at the Black-rock mine.

Butte, Montana, September 20.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—The main shaft at the Nevada Hills is down 450 ft., and a drift will be run from this point to intersect an orebody that was recently cut by the

from its own holdings.—Rawhide at present boasts of 19 shipping properties and it is expected to add three to the list within a short time. Nearly all the active properties are arranging to increase their production.—At the Marigold a 5-ft. vein of milling ore has been opened on the 165-ft. level.—The Little Four lease is trenching on the surface to locate several veins supposed to traverse its ground. The development of the main orebody is steadily progressing.—The Lawyers lease is arranging to drive a cross-cut from the 125-ft. point to intersect a vein that outcrops east of the main orebody.—A 3-ft. vein of high-grade ore has been cut on the Alexander, and is being sacked for shipment as it is broken.—The hoist has been placed in commission at the Bridges-Daniels lease, on Bethania, and sinking has been resumed.—The Mint lease is in a body of good ore.—At Kearns No. 2, the management has increased the working force, and has arranged for a steady production. Conditions in the lower levels are satisfactory.—Owing to lack of adequate milling facilities many properties have been compelled to devote their attention to their high-grade deposits almost exclusively. The custom mills have been almost entirely taken over by the Coalition, Queen Victor or other strong companies, and many small producers are at a loss to market their low-grade production.

Rawhide, September 17.

(Special Correspondence).—The operation of the Florence mill at increased capacity with its new machinery has been delayed by the failure to arrive of two pumps which are necessary for the completion of the plans. Temporary pumps are now being installed by Willis Lawrence, manager, and the mill will be operating with a capacity of at least 160 tons of ore daily in a short time. As the result of experiments carried on for some time, amalgamation has been superseded to a large extent by the use of carpets in saving the gold, and this method has been found successful as well as effecting a material reduction in expense. In August the mill treated 3600 tons of ore, with a recovery of over \$87,000, and it is expected that a better grade of ore will be treated than the \$25 grade that has been sent to the mill in the past. The main tonnage comes from the Little-Florence shaft, whence it is carried to the mill-bins by aerial tramway.

Goldfield, September 21.

LINCOLN COUNTY.

Free & Taylor, of Pioche and Salt Lake, have under development the Bristol-Avon, Kismet-Bristol, and Pioche King properties in Pioche district.

NYE COUNTY.

(Special Correspondence).—Holland, Malley and associates are at work on the 100, 200 and 300-ft. levels of their lease on the Stone Cabin claim of the Jim Butler.—The station on the 1500-ft. level of the main shaft, at the Tonopah of Nevada, is being rapidly completed, and important work in the lower workings will be conducted from this point.—The machinery and material for the Tonopah Extension mill is arriving rapidly and the force of men working on the buildings has been increased.—Excellent ore is being opened in the 200, 275 and 300-ft. levels of the MacNamara. On the 300 the vein is 4 ft. wide and is of good milling grade throughout the 60 ft. exposed. On the 275-ft. level the vein is 3 ft. wide.—Fourteen lessees are working at Ellendale and several report a good grade ore.—On the Clifford-Nay original holdings the adit that was being driven to cut the vein has been abandoned and a shaft will be sunk to the pay-shoot. The adit was driven 120 ft. with no indication of the orebody.—The monthly clean-up of the Shoshone mill has been completed and is estimated to be about \$45,000. Practically all the ore is coming from the glory hole. Extensive explorations are about to commence from the 700-ft. level.—The creditors of the L. M. Sullivan Trust Co. are arranging to perfect details for the



Florence-Goldfield Mill.

winze from the 350-ft. level. The winze is 60 ft. deep, and samples from the shoot assayed \$600 gold and 1000 oz. silver per ton. W. H. Webber is manager.—It is reported that work will be commenced at the Eagle's Nest at an early date.—Reports from the Fairview Eagle state that good grade ore is being opened.—The Nevada Wonder is said to have secured the Horse creek water rights, and will probably shortly arrange for the erection of a milling plant.—The Fairview and Wonder districts continue quiet, but indications are promising for improved conditions before the end of the year.

Fairview, September 18.

ESMERALDA COUNTY.

(Special Correspondence).—Eight stopes are open on the Victor and it is estimated that sufficient ore is in sight to keep the mill in operation for two years. Funds have been raised to double the capacity of the plant. All custom ore for September has been refused, and no more will be accepted for some time to come.—E. W. King, of the Queens, is planning to increase the capacity of the National mill, of which control was recently acquired by the Queens people. This company is arranging to mill 300 tons per day

operation of the Jumping Jack, Stray Dog, and Indian Camp mines at Manhattan on a large scale. These properties are now being worked under a five-year lease by the Manhattan War Eagle Mining & Milling Co. At the Stray Dog, the mill is being overhauled and will be placed in first-class condition. It is reported that a 12-ft. vein of ore running \$12 to \$15 per ton is exposed at the bottom of the 250-ft. shaft. The Mineral Hill Co. has installed a gasoline hoist and will sink to the 300-ft. level. From this point cross-cuts will be run to cut the vein opened at the 225-ft. point.—Placer mining throughout the Manhattan district continues to yield good returns. Work is mainly centered on the main gulch, but the lateral deposit is also receiving attention.—The Johnnie Mining & Milling Co. has purchased the Battery group, on which a vein of \$14 ore was recently opened, for \$6000.—The shaft at the Penobscot is down 50 ft., and has cut several stringers running \$10 per ton. M. Rathburn is manager.

Tonopah, September 18.

STOREY COUNTY.

(Special Correspondence).—It is rumored that the Gould & Curry Co. will shortly resume work on the Sutro Tunnel



The Counties of Nevada.

level. The north lateral is in good condition and the free admittance of fresh, cool air will greatly facilitate the projected work.—The Brunswick lode is attracting much attention, following the rich strike made some time ago in the Baker mine. The Consolidated Virginia has leased its holdings on the lode to George Wright, Benjamin Kelly and William Way. Work has been commenced and it is expected to strike the vein open on the Baker.—The lessees on the Conlan have the shaft down 20 ft. and are working steadily.—The Union claim has commenced work with a small force of men.—On the Comstock-Merrimac two shoots of high-grade ore are being opened. Assays are said to run from \$75 to \$300 per ton.

Virginia City, September 20.

WHITE PINE COUNTY.

(Special Correspondence).—The Butte & Ely Copper Mining Co. has passed to the control of Thomas F. Cole

and John D. Ryan, presumably, for the Giroux Consolidated company. The option on a controlling interest in the stock was taken up last Saturday. It included 229,175 shares of treasury stock and 10,000 shares of individual stock, out of a total issue of 500,000 shares. The option was at the par value of \$1 per share. In order to obtain control it was first required that the individual shareholders contribute 10% of their holdings to the optioners, but the Cole-Ryan interests afterward reduced that to a lump amount of 10,000 shares, which was quickly made up. The holders of the option made large purchases of the stock on the open market under \$2 per share, and it is surmised that they now own probably 300,000 shares. The \$229,175 to be paid for the treasury stock will, of course, go into the treasury of the company, and the new owners really paid for the property only what was paid for the 10,000 shares of individual stock, and such stock as was purchased on the open market. During the three months in which the option ran, the Cole-Ryan people thoroughly explored the Butte-Ely ground, and satisfied themselves as to the value of the property. The ground, consisting of 12 claims and comprising 210 acres, lies between the property of the Giroux Consolidated and the Ely Central, and below the Nevada Consolidated. The Butte & Ely also owns a big water right, the most valuable in the district, and said to be worth really more than the mining property itself, and of which the Giroux company is greatly in need. The water right is capable of furnishing 2,000,000 gallons daily. The new owners of Butte & Ely have elected the following directors, all close personal friends and associates of John D. Ryan: William D. Thornton, Arthur C. Carson, A. L. Longley, J. C. Adams, and L. O. Evans. Mr. Thornton, who is president of the Greene Consolidated company, was elected president of the Butte & Ely; J. C. Adams, vice-president; A. C. Carson, treasurer, and Roy S. Alley, private secretary of John D. Ryan, was elected secretary of the company. It is the general impression that the Ryan and Cole interests are acquiring control of other companies in the Ely district, and that eventually their holdings there will be consolidated in a new company or under the Giroux Consolidated.

At a depth of 865 ft. the shaft of the Boston Ely cut an intrusive formation with considerable copper carbonate on the contact, the shaft to that point being entirely in limestone. The ground through which the company is now sinking is the characteristic capping and it is expected to cut commercial ore below this, as it is similar to that cut in the Alpha shaft of the Giroux company before the ore was opened. Edward W. Ralph is superintendent.

Ely, September 20.

UTAH.

EMERY COUNTY.

The Southern Utah railroad is building an extension from its present terminus at Miller Creek to the holdings of the Castle Valley Coal Co., on Cedar creek. This will open a large territory and the officials of the coal company claim that they will be in a position to ship 1000 tons of coal per day. Recent analyses gave 93% carbon, and volatile matter, and 7% ash.

JUAB COUNTY.

The Swansea mine, at Silver City, has been closed down recently. The management stated that there was no market for the ore, and that the expense of pumping was too heavy to keep up development longer. It was understood that there is a project on foot to drive a drainage adit 500 ft. below the mouth of the shaft.—At the Centennial-Eureka a deep drainage adit is to be driven through the ground of the McKinley Mining Co. to drain the Eureka shaft. C. E. Allen is manager.—The shaft at the Tintic Humboldt is down 50 ft. in a lead-iron-gold ore. John Taylor is superintendent.—The old Eureka Hill mill, at Eureka, is being dismantled and the machinery sold. It was erected in 1893 and put the Eureka Mining Co. in the ranks of the dividend payers, being one of the largest pan-mills in the world.—The Eureka City Mining Co. has obtained the signatures of nearly all the property holders in Eureka to an agreement allowing the company to prospect the ground beneath the town.

Special Correspondence.

MEXICO.

Necaxa Power-Plant — Totolapam, Oaxaca. — New Mill Planned. — Flood Losses at Monterey.

The arrival of F. S. Pearson at Mexico City is likely to mark some further development in the numerous large enterprises in which he is interested in this country. James D. Schuyler, the well known hydraulic engineer, who has been acting as consulting engineer during the design and construction of the dam and hydro-electric power plant at Necaxa, is also on a visit to Mexico. Mr. Pearson and Mr. Schuyler have just completed a tour of inspection of the plant at Necaxa, and Mr. Pearson states that over five millions will be spent in further improvements and in additional reservoirs, which will bring the total storage capacity up to 190 million cubic meters of water, and the capacity will eventually be increased to 100,000-hp. The repairs in the main hydraulic-fill dam are now complete, so that they have caught up to the position that they occupied before the accident of a few months ago, and the dam will



An Old Stamp-Mill in Oaxaca.

be completely finished by next March. The reserve of water actually retained by the dam at present is approximately 8,000,000 cubic meters, and the amount is steadily being augmented. The work now in progress on the power-plant will increase the capacity by a further 16,000 hp. by the end of the year, bringing the total capacity at that date up to 66,000, and by the end of July of next year the total capacity will be 100,000, as already stated. The auxiliary steam plant in the City of Mexico will probably be closed at the beginning of the year, and will only be held in readiness in case of emergency.

Several discoveries in the district of Totolapam, State of Oaxaca, have attracted prospectors, amongst others two well known mining men from the Taviche camp, D. C. Kling and J. S. Mills, are preparing for an extensive prospecting tour to cover several months. The San Francisco mine, in the State of Oaxaca, has sent a quantity of ore to the United States for test treatment. It is the intention of the company to erect a mill of 100 tons capacity, which will be one of the largest in the State.

As the lines of communication that were blocked by the flood in northeastern Mexico are opened up, and news comes in from the more remote points, the already appalling estimates of the loss of life and property have to be increased; some estimates place the total loss of life in the valley at 8900, and the property-loss, including that in the town of Monterey, the railroads, and haciendas and small farmers, at \$50,000,000 to \$60,000,000.

The Rio de Plata company, which is in the Guazapares district, has its new hydro-electric power-plant in operation, and the mill working to full capacity, the shipments for the first half of August amounting to 50 tons of 2000-oz. (silver) concentrate, besides the bullion from the cyanide plant, of which there has not yet been a shipment for August. At the Dolores mine, in the Guerrero district of Chihuahua, a rich surface strike was recently made, running up to several thousand dollars per ton, and though it has not yet been proved, it gives promise of being of considerable extent. From the developed workings, however, the company is taking something in excess of 100 tons per day, or, to be exact, in the last fiscal quarter-year there were produced 9447 tons of a total value of \$246,867, the expense of production amounted to \$155,135, so that there was a profit of \$91,732, or a little over \$30,000 per month.

LONDON.

Lords' Dues.—Carn Brea & Tincroft.

The question of lords' dues has cropped up once more in Cornwall. It is a matter which is always with us and probably always will be unless some super-eminent mining engineer, who is also a commander of large supplies of money, can persuade the landlords to accept co-partnership without obtruding their personalities too much when new schemes for development are being arranged. Lord's dues and the influence of the lord on the methods of working the mines, are relics of the days of shallow hand-to-mouth mining. When old mines are re-opened in Cornwall the same old methods are adopted in most cases by both the miner and the landlord. Though the prosperity of the country in general; and therefore the pocket of the landlord, depends so much on the successful working of the mines, in few cases does the landlord meet the circumstances in a modern spirit. Some of the landlords are generous, but that is not enough. It lies in their power to remodel the whole system of mining without waiting for the hypothetical influential engineer that I have spoken of. Take a case in point. At the Carn Brea & Tincroft, part of the ground belongs to Lord Clifden and the remainder to Mr. Bassett. Lord Clifden has been practically the mainstay of the mine for years. He has bought shares in order to provide capital, and he has foregone his royalties. According to an old lease the dues were arranged on a scale of one-twenty-sixth of the gross value of the output when black tin was £55 per ton, or one-fortieth when over that price. During the first year Lord Clifden paid £80 monthly toward pumping, and on the formation of the present company, in 1900, he subscribed £12,000. When the period of depression was on, he received no royalties at all, that is, during the years 1896 to 1906, though within that time some £200,000 was received from the sale of tin. It was not until 1906, when the price of tin went up, that any royalty was paid. Since the formation of the present company, in 1900, the finances have only just been kept together, at first losses being the rule, and more recently profits being made during the high prices for the metal. The net profit for the whole nine years has been only £800, and during the last three years, during which royalties have been paid, the lords' dues amounted to £9307. It will be seen, therefore, that while the company just managed to keep in existence, the landlord obtained £9307 out of his mineral rights. But he has so far been out of pocket on the whole transaction, for it cannot be said that his investment of £12,000 in the shares of the company has been profitable.

In contrast with this landlord many examples could be given of unsympathetic ones, but that is not the point I wish to argue. Similarly, it is useless to approach landlords and ask for indulgence. These things should be done on strictly business lines. The future of Cornwall depends on the introduction of an entirely new system of mining.

New shafts, geological investigations, large expenditure on equipment, and developments on a modern scale are required, but they cannot be carried out when the landlord's interest is different from that of the financier or the shareholder. The royalty on output should be merged into a proportion of the profit during the life of the company; the landlord should be chairman of the company, and he should have the power to appoint an experienced mining man as a co-director. By 'experienced mining man' I mean not a Cornish bal captain, but an engineer with modern ideas and experience in metalliferous mining gained in more than one part of the world.

SALT LAKE, UTAH.

Profits in Zinc Ore. — Tintic Smelter may Continue. — Red Warrior Ready to Ship.—Consolidated Mercur's report.

Utah mine owners are giving much attention to the zinc industry, since the tariff placed upon the product went into effect. At Park City the Grasselli Chemical Co. is treating the zinc product from the Daly-Judge mine in the new plant recently constructed. Fifty tons per day is being concentrated, from which the mining company is making a net profit of \$10,000 per month. Some alterations have been made in the method of treatment which effects a saving of 8%, and the mill is to be increased to a capacity of 150 tons per day. The United States S. R. & M. Co. has just installed a Huff electrostatic separator in its concentrating plant at West Jordan, and a trial run on the ores from the company's Bingham mines has resulted in securing a 55% zinc concentrate. By this process the company expects to make a saving of zinc which has hitherto been a total loss of \$500 to \$600 per month. George W. Helntz, manager for the company, explains that by this process the lead-silver is segregated from the zinc. The zinc carries off the gold in the slag and both were a total loss, as it was found unprofitable to ship this slag to the Eastern refinery and have it treated.

Since the first announcement that the Tintic smelting plant would close on October 1, Jesse Knight says that a number of shippers have held out inducements for him to continue. The difficulty has been that the ores treated carried too high a percentage of silica, and the company found it impossible to get the character of ores desired to mix with the Tintic product. Some of the Ploche mine owners are anxious to have this smelter continue, and are now making an effort to get regular contracts with a number of mine owners to supply the Tintic furnaces with the ores desired. The Prince Consolidated, of Ploche, has been shipping ore regularly to Tintic, and now that the consolidation of the Ohio-Kentucky with the Nevada-Utah Mines & Smelter Co. has been arranged, another large producer will soon be ready to ship to Tintic. Beaver county mine owners are anxious to send their ores to Tintic, as a much lower rate both for transportation and treatment could be obtained.

W. J. Merritt has again become manager of the Warrior mine in Beaver county. After Merritt had proved the presence of large orebodies in this property some of the Duluth, Minnesota, people obtained control and changed the management. The new owners were not familiar with the country and were not successful in their explorations. It was decided a few days ago to again employ Merritt, and immediately upon taking charge he showed the owners the trend of the veins which have been opened to a depth of 400 ft. The ore is a 'sand carbonate', and has been uncovered on four levels. Shipments will begin at once, and it will be the largest producer in that camp within 30 days.

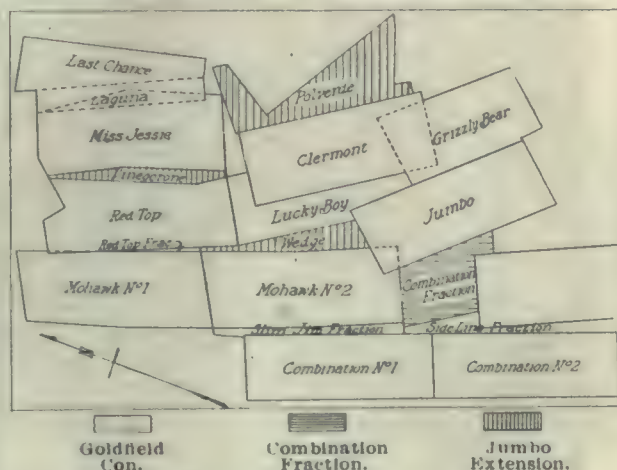
Out of a total production of gold during the year, amounting to \$774,417, the Consolidated Mercur Gold Mines were only able to show a profit of \$33,905. From July to December 1908, inclusive, the profits were \$30,324. From January to June they were only \$3680. During the last six months of the year a much lower grade of ore was milled, and George H. Dern, the general manager, says they found it a hard matter to come out even. The company has a balance account of \$75,029. The average value of the ore being treated is \$3.58, and the loss is 88c. per ton. They have a

large tonnage of ore blocked out, and development is to be continued for the present to ascertain if it be possible to get a better grade of ore, in order that there may be some profit to the shareholders. A slime-plant was built during the year.

GOLDFIELD, NEVADA.

Proposed Assessable Stock.—Combination Fraction.—Clermont Development.—Consolidated Dividends.—Florence Mill Additions.—Tailing Disposal.—Goldfield Daisy.—Goldfield Belmont. Silver Pick

The camp of Goldfield is just six years old and its gross production of gold is conservatively estimated at above \$30,000,000. This year's yield will approximate \$15,000,000 according to the most reliable figures available, and the renewal of activity in leasing operations may enhance this materially. Several important discoveries have been made recently, not only upon the ground of the Consolidated, Florence and Combination Fraction, but in territory that has heretofore been unexplored or unproductive. In common with other high-grade gold camps the development of Goldfield has come about largely through the operations of lessees and an encouraging sign of the times is to be found in the increasing demand for leases on inside territory, particularly upon the Wingfield holdings. This revival of activity has already resulted in the disclosure of good orebodies in ground which has been considered barren. Many of the so-called inside properties have remained idle for many months, the companies having been unable to realize



Map Showing Situation of Principal Mines.

funds for development, and the proposal to re-incorporate some of these concerns upon a basis similar to that of the Comstock companies, making the stock assessable, is being agitated and will be the subject of an address to be made before the members of the American Mining Congress by Herman Zadig, of San Francisco.

The orebody recently opened in the Combination Fraction at both the 300 and 425-ft. levels has been developed to a point which proves its great magnitude and value. The ore-shoot was entered in driving to the south and in the territory embraced in the former Little-Florence lease which was forfeited a month ago. The vein was penetrated by the lessees at a point where the ore was of low-grade and a raise in the vein failed to discover ore of paying quality, but the new shoot, containing seams of exceedingly rich ore in the centre and on the footwall, was missed by only a few feet. The ore-shoot at the lower level is from 8 to 10 ft. wide, and the mine assays for the entire width, have been running from \$120 to \$160 per ton. From an average of \$25 per ton the grade of ore treated by the Fraction company at the Nevada-Goldfield mill of 20-stamps has been increased to above \$40 and for the next month may be expected to average even more than this figure. Another vein carrying \$25 ore, of equal width and nearly parallel with the rich lead, has been opened. At the 600-ft. level of the Mohawk mine, and 300 ft. east of the main shaft, an orebody has been exposed that rivals in richness the best de-

posits found by the early lessees. The cross-cut entered the vein through the hanging wall and has not yet reached the foot wall. The ore is seamed with streaks of high-grade in which the free gold is visible. This discovery was entirely unexpected and it is not yet determined what vein this is, but it is thought to be an off-shoot from one of the veins exposed at the upper levels of the mine. The ore is heavily impregnated with sulphides and the average value thus far, as shown by mine sampling, is far above the best milling grade throughout the orebody. The cross-cut at the 730-ft. level from the Clermont shaft is still in ore, having remained in a continuous shoot of rich material for over 200 ft., the vein turning to the west and following the direct line of this level as originally planned to run for the Mohawk vein.

The northwest lateral from the 600-ft. station of the Clermont shaft has penetrated the hanging wall of the vein on the Lucky Boy at a point farther south and east than was anticipated, and it is apparent that the vein assumes a dip more nearly horizontal at this depth than nearer the surface. Above this point a heavy production is being made

the mills of the Consolidated and Florence. The principal production of the Consolidated is still from the Mohawk mine, from which the output is approximately 10,000 tons monthly, while the Combination, including the great Hampton stope and the Red Top, are yielding nearly 6000 tons every 30 days. Stopping is in progress on the fourth level on the southern end of the Combination No. 1, and the Combination No. 2, near the Florence boundary, and at places in this ore-shoot the stopes are four sets wide or about 20 ft. A fine quality of ore is being mined at this point and a series of shafts will be sunk through the hanging wall into this vein from which a continuous glory hole will be opened for a distance of 700 ft., the waste from the wall above being used in back-filling the lower workings as the ore is extracted. A similar process will be employed on the Red Top and Lucky Boy claims in developing the Red Top vein. The ore reserves have assumed such proportions that it is regarded as more than probable that the company will increase its milling capacity by the addition of further batteries of stamps at the new mill and the old Combination mill will probably be dismantled as its opera-



General View of Goldfield in 1908.

from this vein at the 260-ft. level, and drifts are now being driven both north and south in the vein from the Red Top workings at the 330-ft. level. The north drift, from the Red Top at 260 ft., has been connected with the stopes of the former Consolidated Red Top lease and almost continuous ore of excellent grade is exposed for over 1600 ft. in this vein. The 860-ft. cross-cut on the Clermont has entered the Mohawk-Jumbo ore-shoot which has been followed above at the 730-ft. level, and the ore at the deeper level is superior in quality to that exposed above, carrying seams of exceedingly rich telluride ore. At the 1000-ft. level of the Clermont shaft the cross-cut is being driven rapidly to the west for the Mohawk vein, and other veins will be cut in the intervening territory. Within the next month development at this depth should demonstrate the character and value of the known ore-shoots at 1000 ft. in depth, and in view of the excellent character of the ore exposed at the 730 and 860-ft. levels, great confidence is felt in the result of development at the deepest point in the mines. Delegates to the meeting of the American Mining Congress will be afforded every opportunity to inspect the mines and mills of the Consolidated company and a feature of the mineral exhibit, in addition to an exhaustive display of ores and mill products, will be a full week's clean-up from

tion entails needless expense and a portion of the plant stands above orebodies which are said to be of far more value than the mill.

In opening the Combination vein it is planned to install a large crusher at a point between the apex of the vein and the railroad from which the crushed material will be conveyed to the company's steel cars by means of a belt-conveyor. It has been stated by A. H. Howe, of the Consolidated, that at the November meeting of the directors the subject of enlarging the 100-stamp mill will be considered. This will involve merely the installation of additional stamps, as the crushing, re-grinding and belt-conveying plant is already of sufficient capacity to handle ore for 200-stamps, as are also the cyanide plant and refinery. At the same meeting the directors will consider the payment of an extra dividend in December. The net profits from the company's operations have been more than sufficient to pay the regular quarterly dividend of 30c. per share, and defray all expenses, and have been materially augmented of late by shipments of high-grade ore from the Hampton stope. Experiments are now being carried on by the Florence management with a view to installing a refinery which will treat the concentrate by a process similar in some respects to that employed by the Consolidated company. Several

shipments of high-grade ore have been made from the stopes in the Engineers' vein, and recent development has exposed some new orebodies of great value, one in particular having been opened in territory lying between the former Engineers' and Gem Florence leases and which was missed by a few feet only by the lessees on both sides. The main shaft of the Florence will be enlarged to three compartments to the 500-ft. level, at which point a powerful pump will be installed to drain all the workings, and connection will be made from this shaft with all of the former lease drifts and stopes. At several points in the mine, where development had been abandoned in supposedly barren ground, the resumption of driving or cross-cutting has resulted in the exposure of excellent orebodies, and the Florence mine now has a gigantic tonnage of fine ore blocked out. The most difficult problem of solution which has confronted the Florence management from the inception of the mill has been that of finding adequate space for the tailing. The mill is situated above a rather narrow draw or gully, through which passes the Tonopah & Tidewater railroad, and the expense of constructing retaining walls of waste to keep the tailing within bounds, has been heavy. This difficulty has now been overcome by laying an 8-in. pipe-line from the mill around the Florence hill to a

are coming from the Blue Bull, and shipments are being made by lessees operating on the May Queen, one of the Wingfield groups. Work on a broad scale will be carried on to develop the vein opened on Columbia mountain by B. E. Thomas. This discovery has aroused great interest from the fact that the ore occurs in a contact of porphyry and granite, a formation unique in the district. On this block some exceedingly rich ore, oxidized and showing quantities of free-gold, has been found in the bold croppings rising four feet above the ground.

Development is in progress on the Pipe Dream claim, of the Silver Pick, where a strong vein of quartz, but carrying very low-grade ore, is being followed at 200 and 325 ft. in depth. Cross-cutting is in progress on the Cracker Jack at a depth of 220 ft., on the Mitchell & Fairfield lease, and another 20 ft. should expose the vein passed through above the 100-ft. level, in which an average of \$8 per ton was found. Good ore was opened in the Red Top M. & L. lease, on the Bulldog Fraction, a few hours before the machine house and hoist were destroyed by fire two weeks ago, and the work of installing the new and larger plant is being rushed to completion. On the Atlanta several lease shafts have reached the dacite and there are good indications of ore, the Cherokee lease having cut a good vein at 540 ft. for



Goldfield Consolidated Mill.

point on the Milltown flat adjoining the old Rogers-Syndicate lease, and the tailing will be pumped through this pipe to the flat which is lower than the mill, although not as low as the present tailing pond.

Shipments of ore averaging about \$70 per ton are made daily from the Goldfield Daisy mine, the company work now being devoted to developing the orebodies exposed in the workings of the No. 1 shaft. Mr. Wilkinson, who was recently made president of the Daisy company, is again in charge of operations, and since his return from New York, has granted several leases, two upon different levels of the No. 2 shaft, which is 500 ft. deep, and one embracing the Graham shaft and workings. Good ore is being taken from the 200 level of the No. 2 shaft, the Golden Daisy lease is shipping regularly from the rich vein exposed at the 360-ft. level, shipments will begin within a few days from the Millard-Jones lease and operations are to be resumed on the Toplitz lease in which good ore has been found.

A number of shipments have been made by lessees operating the upper levels of the Goldfield Belmont, and the company work at the 200-ft. level has exposed ore in a blind lead which appears to be the apex of a good orebody. The shaft has been unwatered in preparation for extensive work at the lower levels. The Nancy Donaldson shaft has been timbered to the 100-ft. level, and sinking is again in progress in a good formation. Specimens of high-grade ore

which a cross-cut is being driven at the 600-ft. level. A rich vein has been exposed at the 400-ft. level of the Diadem lease on the Great Bend.

ROSSLAND, BRITISH COLUMBIA.

Le Roi.—Smelter at Northport to Resume.—Development in Centre Star.—Kamloops.—B. C. Copper Co. Active.—Slocan Star.—Influx of American Capital.

It is said that the ore now being taken from the new find in the Le Roi mine will be shipped as soon as the storing space at the mine is filled. This move will, no doubt, necessitate the operation of part of the company's smelter-equipment at Northport, Washington. It is natural that the company should treat this product of the mine and apply the profit therefrom to the development fund. The shaft on the Josie claim of the Le Roi 2, Ltd., is now down 1070 ft., having been sunk 170 ft. since the deepening process began in June last. The shipments from the Le Roi 2, Ltd., were light for the past week, 270 tons, but this was partly occasioned by the attention being given to development. A good body of average ore has been found below the 1600-ft. level of the Centre Star, and at the present time a winze is being sunk on the find to more thoroughly open it. The shipments for the past week were up to the standard, 3730 tons. Things hold steady at the prop-

erty of the Consolidated, and there is no effort at forcing either the shipments or other part of the mine-work.

A deal of considerable importance, especially to the Kamloops district, was consummated in Greenwood last week, when the British Columbia Copper Co. took a bond on seven groups of mining claims, comprising in all about 30 mineral claims, situated in the Kamloops division. The Bonanza, Kimberley, Rising Sun, Giantess, Laura Maxim, and Esperanza groups were included in the deal, which calls for work being commenced in the near future. If the development that will be done on the group by the Copper company proves of value it will no doubt be found advisable to treat the ore at Kamloops and steps will then be taken toward the establishment of the long-sought Kamloops smelter. The effect of the B. C. Copper Co. interesting itself in Kamloops camp will be to stimulate the several companies that have already done a lot of work but are at present inactive owing to lack of interest, and in some cases to lack of funds. Kamloops, of course, may be termed a low-grade camp, but it has been demonstrated

have been taken up by New York men, the Queen by Duluth people, and the Lucky Jim by Spokane capitalists.

AUSTIN, TEXAS.

Iron Ores and Blast Furnaces.—Terlingua Quicksilver Mines.—Shafter Silver Mine.—Mineral Surveys.

Charles M. Schwab, who recently visited the iron ore fields of East Texas, where he leased 30,000 acres of undeveloped ore-lands in Cass county, is reported to have obtained options to purchase more than 100,000 acres containing extensive bodies of iron ore in Marion and Rusk counties. It is announced that mining operations are to be started as soon as the necessary machinery can be installed. Mr. Schwab is said to have under consideration the erection of a large iron and steel plant at Port Arthur, Texas. His iron ore fields are situated about 200 miles north of that place. An iron furnace was operated at Jefferson, in Marion county, for many years. The ore is high-grade. The State of Texas has a 75-ton furnace at Rusk, which is operated in connection with the penitentiary at that place. Considerable exploitation work has been going on for several months in the Llano iron ore fields, about 100 miles north of Austin. R. H. Downman, of New Orleans, owner of the Olive mine, has had drills at work testing the extent of the orebody. The results are reported to have been satisfactory.

The activity in the Terlingua quicksilver district, in Brewster county, still continues. A number of new operators have entered that district and are developing promising claims. The erection of two new furnaces is planned. W. P. Gaines, of Austin, and associates own a large number of sections of land, scattered through the district, and are having the different tracts systematically prospected by William B. Phillips, formerly director of the State mineral survey. Mr. Phillips opened up the famous Chisos mine, owned by the Chisos Mining Co., situated in the Terlingua district. This mine has been producing cinnabar ore at the rate of more than \$15,000 in net value per month for several years. Mr. Phillips has already located several good veins upon the sections of land owned by the Gaines syndicate, and development will soon be started under his direction. The development of the Terlingua district is handicapped by the lack of a railroad. It is 90 miles to Alpine, the nearest railroad shipping point. Enrique Creel, of Chihuahua, Mexico, is at the head of a project to build a railroad from his rich mines in Mexico to a connection with the Southern Pacific at Alpine in order to afford him a shipping outlet for the ore. The route of this proposed road is through the Terlingua district.

Charles Moser, who is operating a rich silver-lead mine in Mexico, just opposite Boquillas, Texas, will soon have ready for operation the aerial tram which he is erecting to convey the ore from the mine across the Rio Grande, a distance of six miles. He will then begin regular shipments to the smelters in the United States. The ore will be hauled in wagons, drawn by traction engines, from the river crossing to the nearest railroad point at Marathon, Texas, 100 miles. The famous silver mine at Shafter, Texas, which is owned by a syndicate of California men, is keeping up its wonderful record of production. This mine has yielded about \$14,000,000 in silver during the last 20 years. It occupies the unique distinction of being the only producing silver mine in Texas. Many apparently good claims have been located in the Shafter section, but little effort to develop them has ever been made. In the vicinity of Alpine, particularly in the Davis mountains, surface outcroppings of gold and silver veins have been found from time to time, but owing to the unfavorable and oppressive features of the State mining law no attempt has been made to exploit these discoveries.

The State mineral survey, which was created several years ago as an adjunct of the State University, had just begun a complete survey of the mineral deposits of Texas when its existence was ended by failure of the legislature to make any appropriation for the new department. An effort will be made to have the legislature at its next regular session make provision for continuing the work.



British Columbia.

that the mines around Kamloops can be profitably worked if the required capital is employed. The B. C. Copper Co. has had the Windfall and Prince Fraction surveyed. This property is situated on the West Fork of Kettle river. It is stated that the bond price on the Sappho property, recently taken over by the B. C. Copper Co., was \$20,000. The ore on this claim assays from 8 to 10% copper.

It is announced that the Slocan Star mine, a rich silver-lead property at Sandon, and which has been much hampered in late years by costly litigation, is about to be reopened on a substantial scale. A new find of rich ore was made upon the property not long ago, so that the management will have something good to start on. It is also good news to hear that the Sullivan group will resume work at an early date. This is one of the largest lead-zinc mines in the Kootenay district. It is likely that the smelter of this concern will also be repaired. Both mine and smelter were recently acquired by a subsidiary company of the Federal Mining & Smelting Co., so that a good financial backing is assured. The Enterprise is a new mine on the shipping-list for the past week, having sent an 8-ton shipment of select ore to the Trail smelter. There appears to be quite an influx of American capital to the growing mines of this district during the last few months. This is observed in the opening of the McGillivray creek coal mines by Minneapolis and Spokane men; the acquirement of the Highland-Buckeye-United group, near Ainsworth, by New York capitalists—who, by the way, have just bought an air-compressor and drilling-plant, also the Fife mines

BUTTE, MONTANA.**Butte-Ballaklava. — Heinze. — North Moccasin. — British-Butte.**

The Butte-Ballaklava Copper Co., the youngest of the mining companies to be organized for operation in the Butte district, is one of the first among them to reach a producing stage. The property is opened to a depth of nearly 1500 ft., with 11 levels from the 100 to the 1400-ft. Five veins have been developed in the ground and two of them are large and opened sufficiently for a good production. Steel ore-bins of 500 tons capacity are about completed, and during the coming week the company will begin mining and shipping ore from three or four levels. For a time shipments will be limited to probably 100 tons per day. Mining will be somewhat interfered with by work in the shaft, as the company will shortly start enlarging the shaft by raising from the 500-ft. level to the surface. Down to 500 ft. the shaft has but two compartments, but from that to below the 1400-ft. level it has three compartments. The work will begin about October 1. The Butte-Ballaklava is owned chiefly by Duluth capitalists, but the stock, of which there are but 250,000 shares, is being well distributed and has just been admitted for listing on the Boston exchange. The property of the company consists of the Burke and Ballaklava claims, which

a remarkable average for such a large vein. It contains many small seams of glance and bornite. No driving has been done on the vein. At the 1400-ft. level all the veins are found, on their dip, south of the shaft. The only vein being opened there now is No. 3, which is showing up even better than on the levels above. The Butte-Ballaklava is operated entirely by electric power, and is probably the only Butte company that has discarded steam altogether, and in doing so it has made a saving of 60% in the cost of its power. Before the introduction of electricity the company worked only to a depth of 500 ft., and operated but one drill, but its monthly cost for power was about \$1500. Now the cost is below \$600 per month and the company is working to a depth of 1400 ft. and is operating six drills, so that the actual saving is probably nearer 75% than 60, considering the increased depth and number of machine-drills. P. H. Nelson, of Duluth, an experienced mining engineer, is vice-president and general manager of the company. When the shaft is completed the company ought to be able to mine and ship 500 tons of ore per day without difficulty. It is in good financial condition, having a working fund in the treasury of about \$300,000, and operations are conducted more economically than at any other property in the district.

**Butte Mines.**

were long tied up in an unsettled estate, and adjoin on the east the Speculator and Edith May properties of the North Butte company, carrying the veins of those mines. On the 100-ft. level the actual depth from the surface is only about 70 ft., and the ore comes to the grass roots. Three veins have been opened on that level and one of them yields 6.5% copper and 50 oz. silver per ton. The same veins are now being opened on the 300-ft. level. Some ore has been shipped from the 500-ft. level for the purpose of getting smelter returns on it, and one car netted the company \$990, the copper content averaging 14.5%. At 700 ft. the veins have also been well developed and the ore runs from 4½ to 7% copper, with 7 oz. silver per ton. The largest vein on this level is 7 ft. wide and has been driven on 125 ft. On the 800-ft. level, No. 3 vein shows a lot of glance and bornite, 4 ft. of the vein giving an average of 7% copper and 8 oz. silver. The orebody has been followed upward for 30 ft. and continues equally valuable to that height. On the 1200-ft. level, No. 3 vein shows a decided increase in size, the entire width not having been determined. The face of the drift is all in ore, the average assay showing 4.77% copper, 6.4 oz. silver, and 60c. gold per ton. A seam of pure bornite 18 in. wide in the side of a drift assays 35% copper and has been developed a distance of 120 ft. It extends both above and below the drift. On level No. 13, No. 1 vein fills the entire shaft and station, a width of 40 ft., and the whole vein gives an average assay of 3.5% copper, 6 oz. silver, and 50c. gold;

The report emanating from Butte a few weeks ago that Heinze was completely out of the Ohio Copper Co. is being confirmed from various sources. The indications are that the Cole-Ryan interests have succeeded Heinze. From the same authority which gave out the story about Heinze's elimination from Ohio Copper now comes a rather startling suggestion that if Heinze should also consent to his elimination from Davis-Daly he could get reasonable assurance that he would never be prosecuted on the indictments now standing against him in New York.

The North Moccasin Gold Mining Co. appears to have been another Barnes-King in the way of promises and failure of performance. The property of both companies is in the Kendall district. The Bank of Fergus county has just instituted proceedings against the North Moccasin company to foreclose on the \$100,000 mortgage bonds and for \$10,000 due on an over-draft. The court is asked to appoint a receiver. The North Moccasin company sold considerable stock, but its shareholders are not so numerous nor so hard hit as the shareholders of the Barnes-King.

A dispute with the engineers' union has resulted in a complete suspension of operations of the big gold-dredge of the British-Butte Mining Co. near Butte. The engineers asked for heat during the recent cold spell, and Mr. DeHara, the manager, decided that it wasn't cold enough. The walking delegate interceded in behalf of the engineers and Mr. DeHara became angry and shut down the plant.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Slag Calculation.

The Editor:

Sir—The enclosed calculation is made from a clipping from a published analysis which is as follows: SiO_2 , 52%; CaO , 9.3; MgO , 0.3; S , 3.5; FeO , 12.1; Al_2O_3 , 4.55; Ag , 3.82 oz.; Au , 0.06 oz.; Cu , 4.35%. As the ore is high in SiO_2 , the best smelting mixture would be a bi-silicate,* that is the oxygen ratio of base to acid as 1 to 2, which would give SiO_2 , 48%; FeO , 32; CaO , 20.

| | Wt. | SiO_2 | MgO | S | FeO | Al_2O_3 | Cu | Ag | Au |
|----------------------------|--------|----------------|----------------------------|------------|--------------|-------------------------|-------------|-------------|-------------|
| | in lb. | % lb. | % lb. | % lb. | % lb. | % lb. | % lb. | oz. | oz. |
| Ore | 2000 | 52 1040 | 9.6 192 | 3.5 70 | 12.1 242 | 4.55 91 | 4.35 87 | 3.82 | 0.06 |
| CaO 53% 280 | | | 53 149 | | | | | | |
| | | | Al_2O_3 91 | | | | | | |
| FeO 64% 703 | | | | | 450 | | | | |
| FeO 64% 131 | | | for matte | | 84 | | | | |

No. of pounds Cu per ton of mixture 55.88.

Ounces Ag per ton 2 4534.

Ounces Au per ton 0.03852.

Total value per ton \$8.59 U. S. currency.

Cu in matte 36.099%.

The SiO_2 of the bi-silicate mixture as given above is as 1 is to 0.666 FeO . The SiO_2 is to CaO as 1 is to 0.416. To make the mixture a bi-silicate as above, the SiO_2 , which is 1040 lb. to the ton of 2000 lb., would require 432 lb. CaO , or 0.416 lb. to each pound of SiO_2 . After making a calculation to use the 192 lb. of CaO and MgO , also considering the 91 lb. Al_2O_3 as a base, it would still leave the mixture short 149 lb. CaO , but if limestone containing 53% CaO was available, it would require 280 lb. of such limestone to furnish the required CaO . As the SiO_2 is to FeO as 1 is to 0.666, it would require 692% FeO to flux the 1040 lb. SiO_2 , or 0.666 lb. to flux 1 lb. SiO_2 , as the ore contains 12.1% or 242 lb. FeO , and lacks 450 lb. of the required flux. If, for an example, a hematite ore could be procured that would run 64%, as I have figured in the calculation, 703 lb. hematite would be necessary to furnish the required 450 lb. FeO . As 84 lb. iron would be necessary for the matte, it would take an additional 131 lb. of hematite. As Cu requires 0.25 lb. S to form Cu_2S , it will require 21.7 lb. S for the Cu , and the 48.25 lb. of S will take up Fe to form FeS at the rate of 1.75 lb. Fe to 1 lb. of S . The total, not counting loss, would make 241 lb. of matte, namely, S , 70 lb.; FeO , 84 lb.; Cu , 87 lb. As the SiO_2 equals 1040 lb., the CaO 432 lb., the FeO , not counting what goes into the matte, equals 692 lb., and 241 lb. matte, a total of 2405 lb., the 241 lb. of matte would be about 10%, not counting losses, or 10 tons into 1. If there should be much of an oxidizing action in the furnace, and a volatilization of the S should take place, a higher concentration could be expected, but with the high SiO_2 percentage and with most of the Fe present in hematite, with very little pyrite or S , and a moderate percentage of CaO , the smelting of such a charge would border on pyrite smelting. Although the SiO_2 is rather high, the melting point of such a charge would be about 1130°

C . Although the heat necessary to melt such a highly silicious charge is lower than some of the singulo-silicate and three-to-four silicate formations of from 10 to 16% lower silica content, it would still be necessary for a higher degree of heat for such acid slags to flow freely. The disadvantages of such a slag would be its viscid and sluggish nature, the lower tonnage put through the furnace, and a train of evils brought about by such a high SiO_2 percentage. The advantages of the slag would be that less flux would have to be used, and where the silicious ore carried gold and silver, a higher percentage of SiO_2 could be used in the ore charge, and less barren FeO and CaO smelted. A high heat would have to be maintained and from 12 to 14% of first-class coke used in the charge. The percentage of Cu in the matte (87 lb. Cu to 241 lb. matte), equals 36.009% Cu . As the entire weight of SiO_2 , FeO , and CaO is 2164 lb., the proportion of the slag is practically SiO_2 1040 lb., 48%; FeO 692 lb., 32%; CaO and earths 432 lb., or 20%. The specific gravity of such an extremely acid slag would be low, and allow the matte to settle well. To make the same ore-mixture into a 3 to 4 silicate (oxygen-ratio), SiO_2 38.16%, FeO 37.48, CaO 24, would require several hundred pounds more flux to the ton of ore. The melting point of such a silicate would be about the same as the bi-silicate mentioned in this article, but with lower SiO_2 and higher base content, it would flow more freely. It would be a matter of experiment to ascertain which would be practically the best slag to make commercially.

G. I. DINWIDDIE.

Chihuahua, Mexico, July 31.

Cyanide History.

The Editor:

Sir—In your issue of July 3 my former colleague and late partner, J. S. MacArthur, takes exception to my statement "that the vacuum-pump and cyanide process were both introduced into South Africa before J. S. MacArthur ever arrived in that territory." He asserts that I went to South Africa early in 1889, and that it was only in June 1890, and under his supervision, that the first demonstration of the cyanide process took place in South Africa. The facts I stated are so obvious, and so readily capable of verification, that I cannot understand Mr. MacArthur's interposition at all. Mr. MacArthur traverses my statement, but offers no evidence.

First, as to the vacuum-pump: Mr. MacArthur, on the morning of his arrival at the works, May 2, 1890 (he arrived in Johannesburg in time for lunch on May 1), saw a vacuum-pump installed at the Salisbury cyanide works for the purpose of recovering solution from the charges being treated. The fact is indisputable; records exist; so that there seems no object in his exception to this portion of my statement. As for the introduction of the cyanide process, we may take it, without quibbling or equivocation as to the meaning of the word, the act of introducing or bringing to notice, that this took place in 1888. At any rate, prior to the end of that year negotiations had been entered into with the Maritzburg Boards which later on culminated in their being the very first to lay down, acquire, or use cyanide

plants, and investigations had also been made regarding the treatment of the ores of the Robinson, Crown Reef, and Ferreira companies, which were the first concerns at which the Gold Recovery Syndicate (or Hennen Jennings) erected cyanide plants on the Rand after the Salisbury (Maritzburg company) demonstration-plant or the small private plant laid down for the purpose of treating the Jubilee (Maritzburg company) tailing.

Moreover, it was in 1888 that a step vital to our interests was taken in South Africa, the successful raising of an action for the cancellation of the Siemens cyanide patent, which, post-dating us at Cape Town, was of earlier date than our own in the Transvaal. This Cape Town action enabled us to have the Transvaal Patent Register rectified, but of the vital importance to us of this early step there can be no two opinions, and I am rather surprised that Mr. MacArthur should have overlooked it and thought South African cyanide history commenced in 1889. Of course if Mr. MacArthur wishes to make some fine definition of the word 'introduction', and to mean that no introduction of the process, in spite of all previous work, could take place in a country until a large 12-vat plant had been erected, then he is faced with the *reductio ad absurdum* that the cyanide process can never have been introduced into Australia at all by the Cassel company, in spite of its being the field of their earliest mission; and secondly, that I must have had the honor of introducing the cyanide process to Mr. MacArthur himself, for up to the time of his arrival at Johannesburg he had, so far as I know, never seen a practical cyanide plant at work—at any rate of any size—other than our experimental apparatus at West Scotland street, and possibly an experimental vat or so rigged up for the purpose of some test in America, whereas on the morning of his arrival at the works I had the pleasure of running through a couple of charges of Salisbury tailing, just to show him how the plant worked, for an extraction of 99.5%—which, of course, is not attained without much previous experience—by the aid of the very vacuum-pump to whose existence he apparently takes personal objection.

There is therefore no difficulty in disposing of Mr. MacArthur's objections to my statement as to the existence of the vacuum-pump and of the cyanide process in South Africa prior to his arrival in that territory, and the early history given above, which may be regarded as official, shows that Mr. MacArthur is incorrect—or else his memory has failed him—in stating that I went to South Africa early in 1889. He is also incorrect in stating that it was only in June 1890 that the first demonstration of the cyanide process took place in South Africa, unless again he has some equivocal meaning of the word 'demonstration'. Prior to the date he mentions we had earned a large sum of money, over £200, for the treatment of concentrate, 'blanketings' and 'skimpings'. We had held various demonstrations, including possibly the most important we ever had there, namely, that attended by Messrs. Von Hessert, Eckstein, Jennings, Phillips, Davis, Dormer, Williams, Michell, and Mr. MacArthur himself, at which I shook some precipitate off the filiform zinc and

melted it in the presence of the spectators so that they might see that the gold was actually extracted. But long before this, material from all over the country had been tested, reports thereon sent to the respective Boards, a number of propositions had been made, and an offer received for the acquisition of the very demonstration-plant to which Mr. MacArthur refers. Indeed, I had already contracted to treat 100 tons of 'buddlings' of the company concerned, by this very plant, which was designed by me (vacuum-pump included) in October 1889, at the time Mr. MacArthur left for his duties in Colorado.

ALFRED JAMES.

London, August 11.

The Editor:

Sir—In your issue of July 17 you publish an intemperately worded series of statements by George Mackenzie, who appears to be the new secretary of the Adair-Usher process at Johannesburg. He controverts the statements of Alfred James regarding this process in his annual article dealing with progress in cyanidation.

I enclose copy of a letter from Mr. Adair himself, which appeared in the *South African Mining Journal* of August 7, 1909, with the request that you publish it. This seems only fair to Mr. James, since Mr. Adair states that "in his remarks Mr. James fairly and rightly hits the nail on the head."

BERTRAM HUNT.

San Francisco, September 14.

To the Editor, *South African Mining Journal*:

Referring to the correspondence between Alfred James and the Adair-Usher Co.: As the discoverer of the process under discussion known as the Usher, I should like to make a few remarks for the information of the industry. Mr. James, unwittingly, and the company, discuss only the most ineffective form of the plant, and in his remarks Mr. James fairly and rightly hits the nail on the head. The fixed-pipe arrangement requires two transfers, that is, one from the de-watering vat, and one from the vat in which the gold is partly dissolved by agitation. In the moving form of the plant, one transfer from the de-watering vat is all that is necessary to obtain better results. Both parties are literally and verbally correct. With some knowledge of processes, I wished the company to install the most effective, that is, maximum-profit plant, but on this point I was over-ruled by the united wisdom of the technical, semi-technical, non-technical, and neutral components of the company. Some slight and trivial difficulties with the moving plant frightened these luminaries into taking the easier and less courageous road to fortune, with the success that might have been anticipated. The present plant is not a failure. As the originator and improver thereof, I could hardly say less than that, but it is a defect from which the other form is free, namely, that channeling is inevitable, a fact acknowledged by the company, and, therefore, being less effective and profitable, it must eventually be replaced by the moving part with one transfer only, which will, I trust, meet with due appreciation by Mr. James and the industry.

ALFRED ADAIR.

Troyeville, Transvaal, August 4.

The Commercial Orient.

The Editor:

Sir—You print a very interesting article in your issue of August 28 on 'Mineral Deposits in Trebizond'. In that connection I wish to recommend consideration of the following table showing percentage of imports which appeared recently in the New York Sun:

| | Total imports. | Per cent from U. S. |
|----------------------------------|----------------|---------------------|
| India | \$443,000,000 | 2.4 |
| China | 342,000,000 | 8.6 |
| Japan | 317,000,000 | 17.3 |
| Straits Settlements | 199,000,000 | 1.0 |
| Hong Kong | 180,000,000 | 4.9 |
| Turkey (Asiatic and European) .. | 133,000,000 | 0.7 |
| Egypt | 129,000,000 | 2.2 |
| Dutch East Indies..... | 88,000,000 | 1.6 |
| Philippines | 81,000,000 | 16.4 |

What sort of a chance has an American mining man or machinery manufacturer of exploiting the Trebizond minerals? Until someone opens a down-right fight, every corrupt influence in the American Government will give preference to foreign shippers and ship-owners.

EDWARD P. NORTH.

New York, September 4.

Gases from Explosives and Mine Economy.

The Editor:

Sir—I was much interested in the editorial and the article by Wm. Cullen on 'Gases from High Explosives', in your issue of August 28. I recently examined an interesting gold mine in Alabama where some experiments have been made with different explosives. The mine is the Hillabee, managed by T. H. Aldrich, Jr. Mr. Aldrich claims to get much better results by using three of the strongest detonators in the last stick in each hole, instead of the one formerly used. He uses nitro-gelatine. Most shots are fired by electricity, but some are fired by fuse. Clay is used for tamping. In drifts, 5-ft. holes are drilled, and in stopes 15-ft. holes, in hard quartz. A hole charged with gelatine and three detonations takes one stick less of explosive, and the extra detonators cost less than one stick of gelatine. It would be interesting if Mr. Cullen or others would experiment with stronger detonators or more of them, and publish the results.

ALBION S. HOWE.

San Francisco, August 30.

Radium Ore.

The Editor:

Sir—I notice on page 332 of your issue of September 4 that a movement has been started under the generous patronage of Thomas F. Walsh, of Colorado, to encourage prospectors and others engaged in mining in their search for ores containing radium. In the appeal accompanying his contribution Mr. Walsh only mentions 'pitch-blende' or uraninite as a source of radium, and quite correctly remarks that Austria has a practical monopoly on this ore by virtue of its large Bohemian deposits. There is, however, another ore of radium which, to my knowledge, has so far only been found in Colorado, and which

promises to become an important one for the production of that metal. Its name is carnotite, that is, a uranyl vanadate, of canary yellow color, and ocherous appearance, mostly occurring in sandstone.

While, at this early stage of our investigations into the properties of radium and its manufacture, but little can be said in regard to the respective richness in radium of these two minerals, pitch-blende and carnotite, my personal observation lead me to believe that the Colorado pitch-blende, which has so far been marketed, is of lower degree of radio-activity than that mined in Bohemia. Mme. Curie has found that the Bohemian mineral has a radio-activity of 8.3, 7.0, and 6.5, respectively, and in the three mines which were worked at the time these investigations were made, while, for instance, the Cornwall pitch-blende which was submitted showed a radio-activity of only 1.6. The Colorado carnotite, however, had a radio-activity of 6.2, and, considering that these samples came from the earliest workings, it is safe to predict that the radio-activity of the Colorado carnotite will at least reach that of the Bohemian pitch-blende, if it does not surpass it. Apart from this there are other considerations which make carnotite a highly desirable ore for the extraction of radium. Carnotite contains variable percentages of vanadium, and this metal and its ores are also highly priced and much sought after, and it is likely, therefore, that carnotite will yield commercial quantities of both uranium oxide, which is the base for making radium or highly radio-active chemicals, and vanadium oxide, from which ferro-vanadium for steel-hardening purposes is made.

A few small experimental plants for the treatment of carnotite have been built in Colorado, and the result appeared to be encouraging. The valuable oxides thus obtained have been shipped to Europe through the inexperience of those who had to dispose of them, and who apparently did not know that there is a ready market for them in New York. It seems advisable, therefore, to encourage not only the search for pitch-blende, but also that for carnotite, which is distinctly an American mineral. Colorado is undoubtedly the most promising State, as already, in the year 1905, H. C. Demming, a geologist from Pennsylvania, after having made an investigation of the radium-bearing rocks of Colorado, said that there are the following 12 counties that can boast of having ores of radium in commercial quantity: Boulder, Clear Creek, Delta, Dolores, Gilpin, La Plata, Mesa, Montrose, Rio Blanco, Routt, San Miguel, and Summit.

E. SCHAAF-REGELMAN.

New York, September 13.

Production of graphite, according to the United States Geological Survey, in 1908 fell off more than nine-tenths as compared with 1907. This great decrease was chiefly due to the total suspension of operations by certain Georgia firms which had been mining a graphite schist for use in fertilizers. This class of graphite, however, was of comparatively little value, and the reduction in total value due to its cessation amounted to only about one-third, from \$296,970 to \$208,090.

GOLD DREDGING IN SIBERIA.

Written for the MINING AND SCIENTIFIC PRESS
By J. B. LANDFIELD.

The extensive and rich placers of Siberia have not, thus far, proved very profitable as dredging fields. In several regions, during the past ten years, dredges have been set up and placed in operation, notably in the Ural, in the Yeniseisk *taiga* region, and on the Zea and its tributaries, but with few exceptions they have proved unsuccessful. The reasons for these failures deserve looking into, because of their bearing on the future development of the country. The gold mines of Siberia at the present time consist almost entirely of river placers. The Ural region has a number of quartz mines, and about two-fifths of its gold production comes from this source, but administratively this belongs not to Siberia, but to European Russia. Of Siberia proper, nearly 95% of the gold-production is alluvial. The gold-bearing grav-

pierced with 1-in. holes, and forming rude grizzlies. These plates are sometimes replaced by loose planks that have 1½-in. holes bored in them at intervals of 6 in., these holes being connected by grooves on the under side. This long tom, which is called a 'butara', is set at a grade somewhat steeper than that of an ordinary sluice-box, and a very modest amount of water is let in at the upper end. The gravel is usually brought up in wheelbarrows and dumped in on one side at the head. On either side of the 'butara' are men with instruments that look like dull hoes, with which they break up the lumps and assist in the washing of the gravel. For this work five or six men are required. At the lower end of the 'butara' is a kind of grizzly with 5⁄8-in. holes, and the tailing that is stopped here is hauled away in wheelbarrows. The finer material then drops to a short, steep sluice in which are placed cross-riffles at intervals of 8 to 10 in. The riffles are frequently crescent-shaped, with the concave side up stream. Altogether the



The Butara or Washing Machine in Siberia.

els of Siberia are widely distributed. Each of the great rivers has among its tributaries several 'basins' from which placer-gold is produced, and some of these rival in richness any to be found elsewhere in the world. The richest of all are probably the placers of the Vitim and Olekma river basins of the Lena region, where \$25 to \$30 per cubic yard is not uncommon, but in the valley of the Yenisei, along many of the tributaries of the Amur, notably the Zea, and elsewhere throughout Siberia, are to be found placers that would cause big stampedes if they were situated on the other side of Bering Sea.

The methods of working are crude. In most cases a drainage ditch is dug from the lower end of the ground, while at the upper end, if necessary, the water is diverted, and a portion of it is conveyed to the washing machines in wooden sluices. The washing machine almost universally used in Siberia consists of two parts, a long tom and a short, steep sluice. The long tom is usually 5 or 6 ft. wide and 20 long. It is built of 2-in. pine or spruce planks, the bottom planks running cross-wise. Near the bottom, raised about 2 in. above it by cleats, are laid iron plates

machine is very crude and allows a lot of gold to get away. It is expensive to operate in spite of cheap labor, and the fundamental error, an error that is everywhere to be noticed in Siberia, is that of not letting water do the work.

The Siberian mine-owner is a curious type of man. In small transactions he is shrewd to a degree, but he seldom has any idea of business organization, and is at the mercy of dishonest superintendents and managers. He is generally satisfied to let things take their own course as long as some profit is coming in, and if there be a deficit, he will borrow from the bank as long as it will loan to him. He seldom analyzes the cause of the deficit. On the other hand he reads or has read to him, for he is frequently illiterate, some account of the methods used in other countries. The conditions under which they are practicable do not concern him much, what interests him chiefly is that, by dredging in California, gold is recovered at a cost of 5c. or less per cubic yard of gravel, whereas it costs him from 12 to 20 times as much.

Except for the cleverness of certain German manu-

facturers, however, few mine-owners would have done more than talk of the ingenuity of the Americans, and dream over the profits possible with such appliances. The German scheme was a clever and simple one, and in the absence of Americans their representatives had the field to themselves. First they ascertained that the placer for which they proposed to supply a dredge contained enough gold to cover the cost. Then they offered to equip the mine with a dredge complete and take their pay out of the gross product, representing to the owner that in this way he ran no risk, as he had nothing to pay in advance. Needless to say many proprietors jumped at the chance. The German company had no experience in building dredges for gold mining, and proceeded to erect poorly made dredges which it sold for \$30,000 to \$40,000. The gold-saving apparatus was crude, and the machinery was not durable, but the Germans could easily get their money out of the gross product before it went to pieces. Noting the growing enthusiasm for dredging, and the profits of the German manufacturers, one of the iron works of St. Petersburg also engaged in the manufacture of dredges. This firm knew just as little of the practical side of the work, but built much more durable machines.

It is not surprising, therefore, that most of the Russian dredging operations set on foot in Siberia proved failures, if for no other reason than their faulty equipment. But there were numerous other causes of non-success. Few forms of gold-mining require so many conditions as a requisite of success as dredging. First of all comes the question of bed-rock and boulders. My observation in this regard is that a majority of Siberian placers, if not too near the head of a stream, are free from large boulders and have a satisfactory bedrock. It is surprising how many of them have from one to three feet of partly decomposed rock as a bed. On the other hand, many of them are overlaid by a stratum of greasy clay which in sluices rolls up into balls and interferes seriously with gold-saving. Besides this there is also the difficulty of frozen ground. The area of permanent frost is, however, much less than generally supposed, and the trouble occasioned by the climate is of a commercial rather than a technical character. In the case of an expensive dredge and outfit, it is a serious matter to let it lie idle six or seven months in the year, on account of interest charges and deterioration.

Labor and fuel are for the most part cheap. Forests abound and wood can be had at the dredge for about \$1.50 per cord. Labor costs from 50c. to \$1.25 per day, according to the locality, and is not good. Individually the Russian miner is an excellent workman, learning quickly, living frugally, and capable of great exertion. In large numbers, however, and especially at distant points, he easily becomes insubordinate and unruly. This tendency has become stronger since the labor troubles and political agitation of 1895. Formerly one of the great labor difficulties was the large number of religious holidays, each of which meant at least two days of idleness, one for the celebration and one for getting sober. Now all the Siberian mines give their laborers two

days in each month, in lieu of Sundays and holidays. Dredges, therefore, wherever technically practical, would simplify the labor problem. The few men required could easily be trained, and they would be found efficient.

The question of management is more difficult. While it is comparatively easy to train efficient workmen in Siberia, it is next to impossible to find efficient and trustworthy superintendents and overseers; in fact, officials of any kind. The technical schools in Russia turn out a lot of men who are too proud to soil their hands with labor, and whose book-knowledge only serves to make them impractical. They are not only impractical, but are without any sense of personal responsibility. To be successful a dredging enterprise in Siberia requires a foreigner, preferably an American, of practical experience, and one who speaks Russian or will acquire it quickly. A superintendent who does not speak Russian is at a great disadvantage; he must depend on the unsatisfactory services of an interpreter, and cannot get into touch with his workmen so as to understand their ways and how to train them.

Few indeed of the Siberian mine-owners who have tried dredging have succeeded in clearing the hurdles of bedrock, boulders, labor, management, winter-charges, and dredge-efficiency, but this is not to be wondered at when one considers the large number of failures in dredging in our own country and the thousands of tons of machinery rusting in placer fields everywhere from Alaska to Mexico. Another problem also faces them; one that is too often neglected in undertaking such operations. It is difficult for the Siberian to realize that the contents of a placer are limited, and that the cost of a dredge must be amortized in a comparatively short period. The average dredging ground which I have examined in Siberia has been shallow, and a good-sized dredge would be kept moving rapidly. It is exceptional to find a deep placer outside of the Lena region, and it is not possible to count on the long period of operation which is the basis of most of the Californian dredging. Two other peculiarities are noteworthy. The gravels in a large number of Siberian placers are 'spotty'; rich streaks and pockets occur without any apparent reason for the concentration, and coarse gold is frequently found in the lower reaches of a stream. I am inclined to regard this as closely related to the climate, which makes it possible for frozen lumps of rich gravel to be conveyed considerable distances and become disintegrated on the spot where they find lodgement. This irregularity makes it difficult to estimate the tenor of ground for dredging. Furthermore in most instances it will be found that the overburden is almost entirely barren and cannot be counted upon to bring up the average.

Notwithstanding the difficulties I have mentioned, and the failures of many of the Russian dredging enterprises, I believe that there is a great future in Siberia for Americans, there is opportunity for applying to the innumerable placers the apparatus best fitted to their individual conditions, and at the same time giving them business-like management. In many cases it will be found that shoveling into sluices is the best solution; in others steam-shovels,

scrapers, and mechanical conveyers and elevators may be advantageous; but there will also be found a large field for dredges designed specially to meet Siberian conditions, where the gravels are rich enough to offset the period of winter-idleness and the increased cost of management.

Heretofore Siberia has attracted but little attention in American mining circles. The general opinion regarding it has been largely based on sensational novels, and on the tales of escaped convicts. It will doubtless surprise many to be told that the summer climate of Siberia, from May to November, is delightful, and that the winter in most parts compares favorably with Montana. The mining laws of Russia are superior to our own in many ways, and personally I have received nothing but courtesy and assistance from all the mining officials with whom I have had to deal. It is true that there exists a party in Russia that believes in 'Russia for the Russian', and is opposed to the introduction of foreign capital, but this does not interfere with the rights of foreigners under the law. Many an unsuccessful manager for an English or French concern has returned to excuse his failure on the ground of official interference, when the real cause has been a poor property or his own inefficiency. It is apparent from the recent Russian journals that there has been this summer a rush of foreign engineers and business men to Siberia looking for mining and other opportunities, and Americans should step in and get their share.

Coal and oil are attracting attention in Panama, according to Claude E. Guyant, Vice-Consul General, who states that Adolpho Aleman has closed a contract with the local Government for the exploitation of certain deposits which he has discovered. In the district of Los Santos, near the Tonosi river, he has discovered six separate veins of coal. These deposits cover a considerable area of ground, but as yet no surveying has been done, nor any experimenting more than the taking of surface samples. Mr. Aleman also claims to have discovered indications of petroleum deposits on this land. The land belongs to the Government of Panama, but Mr. Aleman has been given absolute rights as regards coal and petroleum.

Adsorption is the property by which dyes and other substances are extracted from solution and incorporated into the thing dyed. It differs from absorption, which is incorporation of a liquid as it stands, irrespective of what it holds in solution. Adsorption is especially characteristic of the peculiar substances known as colloids, which form the bulk of clays, and on which their plasticity is believed to depend. The amount of dye, therefore, which a given amount of clay will adsorb from a standard dye solution indicates pretty accurately the proportion of colloids that the clay contains.

A mining location which exceeds the maximum limit is void only as to the excess, unless fraud is shown. The locator has the right of selection of the ground to be retained, even as against an overlapping locator.

RADIUM EMANATION.

Written for the MINING AND SCIENTIFIC PRESS

By F. H. MASON.

The metal radium, if it serve no other useful purpose, and it hardly seems probable that it is doomed to such an unfortunate fate, has been productive of some brilliant researches. In working with radium, the chemist has been privileged to use only the minutest fragments of the metal, and consequently he has had to devise apparatus and methods entirely foreign to those generally employed in research.

Among the latest contributions to the chemistry of radium are the researches carried out jointly by Sir William Ramsay and Robert Whytlaw Gray with a view to determining the atomic weight of 'radium emanation', and finding a place for that substance in Mendeléeff's periodic table. Ramsay and Gray proposed to find the vapor pressures of the emanation at varying temperatures, and from these to determine a place for it in the periodic table. It is not given to ordinary mortals to think in such minute quantities as fractions of a cubic millimetre, and when we say that the quantity of 'radium emanation' taken for the experiments varied from one-tenth to one-eighth of a cubic millimetre, it will convey little to the mind of the average reader. Some idea of the minuteness of the quantity, however, may be obtained from the fact that fine-bore thermometer-tubing was found to be too coarse a piece of apparatus in which to condense the gaseous emanation to a liquid form, so it had to be drawn out, in order to reduce the bore, and, after calibration, the graduations had to be read by the aid of a microscope.

The emanation was collected from radium bromide, $\text{RdBr}_2 \cdot 2\text{H}_2\text{O}$, dissolved in water. Radium bromide continuously decomposes water. The bromide solution was contained in three bulb-tubes, connected with a pump, by means of which the products of decomposition of the water, together with the emanation, could be drawn off as required. The rate of evolution was constant; 25 c.c. of gas being generated in seven days. This gas, mainly the product of the decomposition of water, was conducted into an explosion-burette and exploded. After explosion the volume of gas generally shrank to 0.2 c.c., and always consisted of hydrogen, together with 'emanation'. The quantity of hydrogen varied slightly in the different experiments; the experimenters are at a loss to account for the variation. When sufficient gas had been collected, the 'emanation', together with the hydrogen, was conducted into an apparatus where it was purified from gases other than hydrogen. The gases were then placed under pressure, cooled by liquid air, and condensed to a liquid. The apparatus was then connected with a vacuum-pump, and completely evacuated of gas. In this was the hydrogen, together with a little helium, which was contained in the emanation, both being non-condensable, were removed. The pump was disconnected, the liquid-air jacket removed, and, after the 'emanation' had volatilized, it was forced into the small capillary tube, made from drawn-out thermometer-tubing. The tube was then cut from the apparatus, connected with a compression apparatus, and the

gases compressed until liquid appeared. It was then jacketed at various temperatures, and the corresponding pressures were read.

As it was impossible to accurately weigh the mercury, which only formed a thin thread when forced into the drawn-out thermometer-tube, the tube was calibrated by comparing the length of a thread of mercury at a number of points by means of a traveling microscope. The thread was then sucked into the wider capillary of that part of the tube which had not been drawn out, and which was of even bore, and its length again microscopically determined. The volume of a known length of the thermometer-tube was determined by weighing the mercury that filled it. The quantity of the liquid ‘emanation’ that had to be measured, which, of course, varied in the different experiments, averaged only about 0.00025 cu. mm., and it occupied 0.24 mm. (less than one-hundredth of an inch), length of the tube.

The experimenters describe the properties of the liquid and solid ‘emanation’ as follows: “The liquid emanation is colorless, and transparent, like water, when seen by transmitted light; it itself is, however, phosphorescent, and shines with a color varying with the nature of the glass forming the tube in which it is confined; it might be more correct to say that it causes the glass to be phosphorescent. The color varies from blue to lilac; in silica, it is blue; in lead-potash glass, bluish-green; in soda-glass, lilac; when com-

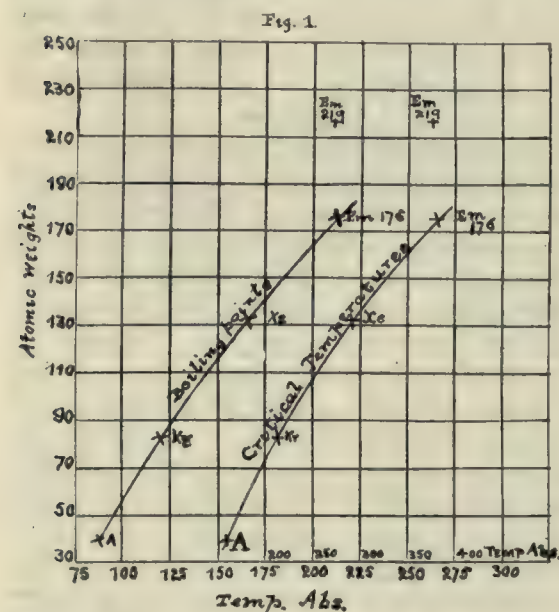
Further reduction of the temperature changes the color to yellow, and in liquid air it is brilliant orange-red; the color-change takes place in inverse order on warming. The red phosphorescence disappears pretty sharply at 118°.” The boiling point of the liquid ‘emanation’ was found to be -62 or 211° absolute, and the critical temperature 104.5 or 377.5° absolute. The vapor-pressures of the ‘emanation’ are given in the following table:

| Pressure, mm. | Temperature, deg. abs. | Pressure, mm. | Temperature, deg. abs. |
|------------------|---------------------------|------------------|---------------------------|
| 500 | 202.6 | 20,000 | 321.7 |
| 800 | 212.4 | 25,000 | 334.5 |
| 1,000 | 217.2 | 30,000 | 346.0 |
| 2,000 | 234.5 | 35,000 | 356.0 |
| 4,000 | 255.3 | 40,000 | 364.4 |
| 5,000 | 262.8 | 45,000 | 372.9 |
| 10,000 | 290.3 | 47,450 | 377.5 |
| 15,000 | 307.6 | | (critical) |

In the periodic table the group of inactive gases is:

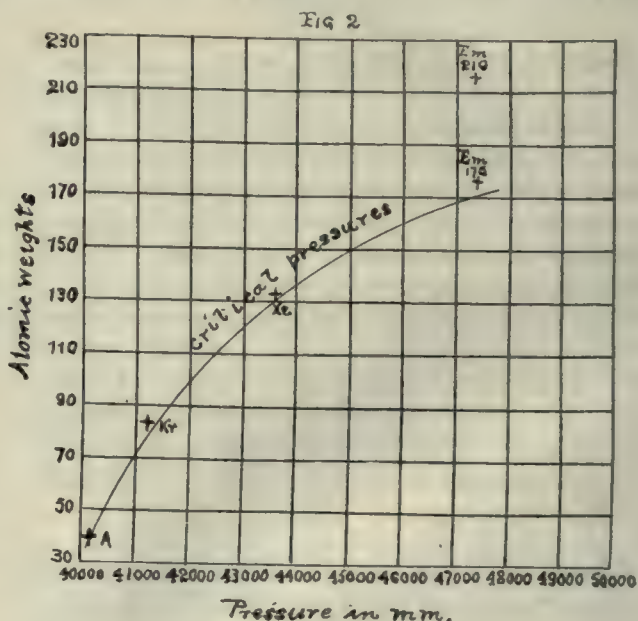
| Element. | Atomic weight (in whole numbers). | Differ- ence. |
|---------------|--------------------------------------|------------------|
| Helium | 4 | .. |
| Neon | 20 | 16 |
| Argon..... | 40 | 20 |
| Krypton | 83 | 43 |
| Xenon | 131 | 48 |

According to Mendeleeff’s hypothesis, which owing to its accurate fulfilment in so many instances,



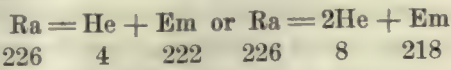
pressed strongly in soda-glass, the color reminds one of the cyanogen flame, at once blue and pink. On cooling further, the liquid solidifies, and ceases to transmit light, on warming, it again becomes transparent. This gives a means of determining its melting point, using a pentane thermometer, which registered correctly at the ordinary temperature and at the temperature of a pasty mixture of carbon dioxide and alcohol (78.3°C.*). The actual temperature at which the emanation melts is 71°. On cooling further, with alcohol cooled with liquid air, the color of the phosphorescence changes. The solid glows with great brilliancy, like a small, steel-blue arc-light.

*Travers, ‘Experimental Study of Gases’.

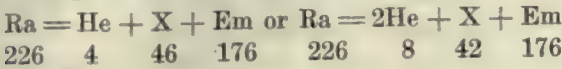


is practically accepted as law, it may be expected that other elementary bodies will be found, having $(175 + 44) = 219$, and $(219 + 44) = 263$; that is, at three periods separated by about 44 each, commencing at the atomic weight of xenon. The authors, by a series of curves, in which the boiling points, and critical temperatures (Fig. 1), and critical pressures (Fig. 2), of the ‘emanation’, and of argon, krypton, and xenon, are plotted against their respective atomic weights, endeavor to show that the atomic weight of the ‘emanation’ is, in all probability, 176, and not 219, as has been suggested by other experimenters. They conclude: “We are aware that the deductions drawn from these results, namely, that the ‘emanation’ has an atomic weight of 176, does not

agree with the theory advanced by Rutherford regarding the progressive degradation of radium. Perhaps a non-radio-active substance is simultaneously produced when the 'emanation' escapes from radium. It is possible to speculate that, instead of the equation:



the change actually occurring should be:



Certainly the ingenuity of the experimenters in devising apparatus for determining the vapor density, boiling and freezing points, critical temperature and pressure of such infinitesimal quantities of the emanation, is extraordinary.

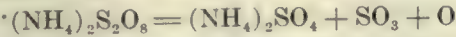
RESEARCHES UPON CRIPPLE CREEK TELLURIDE ORES.

*Among the gold-producing districts of the world Cripple Creek district, of Colorado, stands as one of the foremost. This volcanic area, three miles long by five miles wide, embodies a network of gold-carrying veins, running in all directions, intersecting each other and comprising a series of ore-shoots the magnitude of which is inconceivable. Along with the development and mining of the higher grades of ore material has simultaneously been developed, which, although of sufficient value to term ore in some other parts of the world, on account of its refractory nature is left standing in the mine stope or thrown upon the waste-dump. The refractory nature of these ores is due largely to the occurrence of the gold in combination with tellurium, forming a compound (Au-Ag)Te₂, which is represented by the minerals calaverite, or sylvanite, and also to the association or encasement of these gold tellurides in crystal growths of the characteristic mineral pyrite.

The history of the metallurgical treatment of these ores is conspicuous for the number of metallurgical failures which have taken place, due largely to the difference in the physical properties existing between gold telluride and native gold, and partly to the insolubility of the tellurides in cyanide solution. Stamp-milling followed by amalgamation was first tried; concentration failed, while at the smelting works these ores were not desirable owing to their high silicious character. Only after roasting to free the gold of its volatile associate have the ores been susceptible to lixiviation processes. Consequently, roasting, followed by barrel chlorination and concentration has become the popular treatment. This method works well so far as extraction is concerned, but as the amount of low-grade ore standing in the stopes and upon the dumps becomes larger year after year, it becomes apparent that a cheaper method of treatment must be found. With this end in view the Portland Gold Mining Co. experimented extensively.

Fine grinding in cyanide solution followed by agitation and filter-pressing was first tried, but difficulty in dealing with the stubborn sylvanite was experi-

enced, so that efforts were naturally directed toward finding a solvent for tellurium. It was found that the tellurium yielded to some extent under the action of oxidizing agents, and after trying various acid mixtures it was resolved to find an alkaline solvent. The most successful were the alkaline per-sulphates, alkaline hypo-iodites, and cyanogen iodide. The chemical behavior of the alkaline per-sulphates is little known to metallurgists. They are not only solvents for tellurium, but their action when used in connection with cyanide solution is extremely interesting. They act as slow oxidizers or depolarizers, thereby greatly increasing the dissolving power of cyanide solution, and when used in small proportions, 1 to 10 lb. per ton of solution, they do not destroy the cyanide to any great extent. A good deal of theorizing regarding the chemical action of these substances, especially when used in connection with cyanide solutions, has been indulged in. When in solution alone, they act as strong oxidizing agents, as follows:



But when mixed with cyanide solution, their oxidizing influence is greatly retarded. In view of this fact, together with results obtained in small tests, it is evident that the per-sulphates, if produced at a low cost, could be generally used in cyaniding as oxidizing agents. They are quite stable compounds, and when mixed with working cyanide solution would oxidize reducing agents, thus greatly aiding dissolving efficiency and precipitation.

A recent article, 'Cyaniding of Silver Ore in Mexico', by W. A. Caldecott, brings to mind a possible field for these substances as a means of dealing with the reducing agents, which this article states are a great source of trouble. Ammonium per-sulphate is a good solvent for silver, but to what extent this property can be applied in ore-treatment has not been determined.

The following few small tests have been made on the solution from the tailing mill in the endeavor to find the effect of per-sulphates upon cyanide solution when used as oxidizing agents.

Three assay tons of blanket concentrates which assayed 108 oz. gold per ton were put in each of six bottles; in each bottle was poured 262 c.c. of regular 1-lb. tailing-mill solution; this made a three to one pulp, and 10 lb. of lime per ton of ore was added. To the first three bottles respectively, was added 0.1, 0.25, and 0.5 lb. of ammonium per-sulphate per ton of ore; the last three bottles being left as straight cyanide treatment. All the bottles were well shaken and stood over night.

| No. | Cyanide consumed per ton of ore, | Ammonium per-sulphate added per ton of ore, | Solution assay value, |
|--------|----------------------------------|---|-----------------------|
| | lb. | lb. | oz. |
| 1..... | 0.55 | 0.10 | 4.13 |
| 2..... | 0.55 | 0.25 | 4.35 |
| 3..... | 0.55 | 0.50 | 4.46 |
| 4..... | 0.60 | None. | 3.54 |
| 5..... | 0.55 | None. | 3.82 |
| 6..... | 0.55 | None. | 3.72 |

From these experiments is readily seen the effect of the increased dissolving efficiency obtained when an oxidizing agent is used, the consumption of cyan-

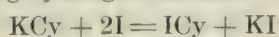
*By Portland Met. Soc., Edited by Thos. B. Crowe. Jour. Chem. Met. Min. Soc., South Africa.

ide being practically the same as the straight cyanide treatment. Taking the average solution assay 4.313 oz. of the three bottles to which per-sulphate had been added, and comparing the average solution-assay 3.693 oz. of the three bottles where no per-sulphate was added, and multiplying each average by three (as three to one pulps were used), there is obtained a difference of 1.86 oz. extracted by the addition of small quantities of per-sulphate. The low extraction obtained in either case is surprising, but it is a good example of the refractory nature of the gold. This material had passed through a roasting furnace, through chlorination barrels, over the Wilfley tables, then ground to 60-mesh in 1-lb. cyanide solution, then caught on blankets, and was merely used in these experiments on account of its value to make a decided case.

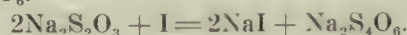
As stated before, alkaline per-sulphates are solvents for tellurium, and when mixed with cyanide solution completely dissolve the telluride of gold. Several bottle tests were made on ore, using a solution of alkaline per-sulphate as a preliminary treatment followed by cyanide solution, the object being to first dissolve the tellurium, leaving the gold in a condition susceptible to cyanide solutions, but with poor results on account of reasons explained later, except where extreme amounts of per-sulphates were used. There was also tried a treatment using the alkaline per-sulphate and the cyanide together in the same solution, dissolution of the tellurium by the per-sulphate and the dissolution of the gold by the cyanide going on simultaneously, but with uneconomical results due to reasons explained later.

Alkaline per-sulphates, like some other oxidizing agents, liberate iodine from potassium iodide in an alkaline solution, the liberated iodine combining with the alkali present to form alkaline hypo-iodites, which compounds dissolve tellurium; it was, therefore, concluded that the addition of potassium iodide to a solution of per-sulphate plus cyanide would form this tellurium dissolving compound, while the cyanide present would take care of the gold, the two working simultaneously.

For a long time the experimenters were led astray. They had found that an excess of alkali in a solution of potassium cyanide plus potassium iodide, plus alkaline per-sulphate, greatly increased the solubility of gold leaf; test after test with good excess of alkali was tried, believing that the solution that had the greatest dissolving efficiency upon gold, would have the greatest efficiency upon the telluride of gold, and working on the theory that the liberated iodine formed hypo-iodite, which dissolved the tellurium, the cyanide present dissolving the gold, it could not be seen wherein an excess of alkali would be injurious; but failure to obtain a good tailing invariably followed unless we used an uneconomical percentage of per-sulphate. Finally, it was discovered that cyanogen iodide was an exceedingly good solvent for the telluride of gold, and it seems possible to form cyanogen iodide in a solution of this kind by the action of the per-sulphate upon the potassium iodide, the liberated iodine combining with cyanide forming cyanogen iodide:



Knowing the similarity existing between cyanogen iodide and cyanogen bromide, and having some knowledge of the cyanogen bromide process, the experimenters worked upon the theory, that the existence of cyanogen iodide depended upon the absence of excessive quantities of alkali. In following this out it was found that low tailings resulting, even with very weak solutions. A solution of 1 lb. cyanide, plus 1 lb. potassium iodide, plus 3 lb. alkaline per-sulphate per ton of solution, in a pulp of three of solution to one of ore, with 4 or 5 lb. of lime per ton of ore, gave on 1-oz. ore, ground to 100 mesh, tailings of less than \$1, with a consumption of cyanide of about 1 lb. per ton of ore. But the solutions after leaving the ore and standing in contact with the air, lost their cyanide, a hard thing to believe, as the same solution before being applied to the ore would stand in a beaker indefinitely with very little loss of cyanide. Even when in contact with the ore in a bottle this loss was not excessive, but when separated and left to stand, the cyanide in some cases disappeared rapidly. This loss was more pronounced when treating heavy sulphide ores; and it became apparent that it was due to the formation in the solutions of $\text{Na}_2\text{S}_4\text{O}_6$. Sodium thio-sulphate, $\text{Na}_2\text{S}_2\text{O}_3$, being formed by the action of the per-sulphate upon the pyrite, is probably further oxidized to $\text{Na}_2\text{S}_4\text{O}_6$.



When the solutions are in contact with the ore, the reducing action of the ore aids in overcoming oxidizing influences, but when separated, the oxidation becomes more violent. The action of the air seems to have a marked influence on the cyanide destruction, as at any rate, a decided difference in consumption is noted in using closed and open agitators. However, it was found that on passing the solution through the zinc-boxes, the deterioration of the cyanide is stopped, due undoubtedly to the reducing action there.

Experiments in a small way upon the manufacture of sodium per-sulphate by the electrolysis of salt cake yielded a product which, when used in bottle-tests, answered very well, so that it might be produced on a large scale at a reasonable figure.

Potassium iodide, although an expensive chemical, would remain as such in the solution, the per-sulphate causing it to give up its iodine, this iodine combining with the cyanide to form cyanogen iodide, or with the alkali to form an alkaline iodide, or alkaline iodate, but always finally reverting back to an alkaline iodide, as any iodate formed would be reduced to iodide in the zinc-box. Cyanogen iodide is certainly a wonderful solvent for gold tellurides, and its production by this method presents a possible field for ore-treatment. In the practice of using cyanogen bromide as a solvent, one of the troubles other than its cost, is its rapidity of action, as it remains as cyanogen bromide only for a limited period, and does not act sufficiently long to cause the dissolution of the telluride of gold. One can, therefore, readily see that if it were possible to produce it in a smaller manner to that described, a much weaker solution constantly in contact with the ore, would have a decided advantage.

SOLUTION OF KUTTER'S FORMULA.

By L. I. HEWES and JOSEPH W. ROE.

*A graphic solution of Kutter's formula for the flow of water has been worked out by L. I. Hewes in connection with his course in graphic computations, given in the Sheffield Scientific School, Yale University, which may be of interest to those who deal with canals, flumes, and streams.

41.66

$\frac{1.811}{n}$

$\frac{0.00281}{S}$

$1 + \left(41.66 + \frac{0.00281}{S} \right) \frac{n}{R}$

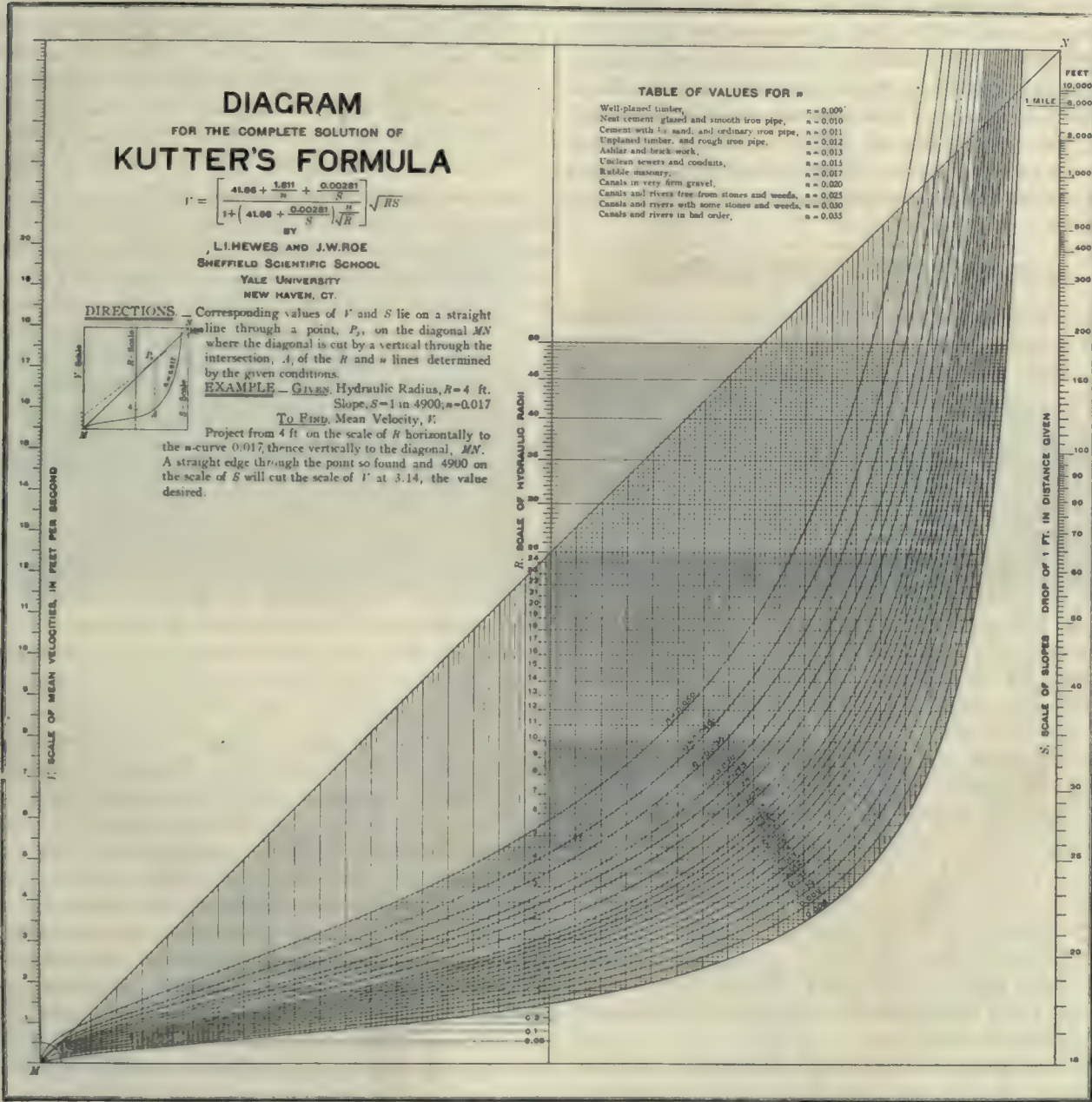
\sqrt{RS}

\sqrt{RS}

Kutter's formula, $V =$

is probably the most accurate of those proposed de-

one for the mean velocity, V , one for the hydraulic radius, R , and one for the slope; a diagonal line, not graduated; and a set of curves for the various values of n , the factor which involves the nature and condition of the bottom. Usually, R and S have been determined; n , assumed, and it is desired to calculate V . In this case the diagram is read as follows: From the given value of R on the middle scale project horizontally to the curve of the n -value assumed; thence project vertically to the diagonal. A straight edge through the point on the diagonal so found and the point on the S -scale determined by the given conditions, will cut the V -scale at the required mean velocity. The chart furnishes a means of determining any one of the four factors, the other three being



and the n -curves cover all the values given in any of the books of reference.

The accuracy of the chart is about uniform for the different conditions. Where the n -curves are acute to the R -scale the scale itself is very coarse, thus compensating for any error due to the obliquity of the curves. Opposite the upper end of the R -scale, where its graduations are finer, the n -curves have turned and are nearly parallel to it, so that an error in reading the R -scale has little effect on the location of the pivot-point on the diagonal. Each of the curves has been checked by calculations, and the mean error of the total readings was only 0.53%. The V -scale, on which the results are usually sought, with reasonable care in reading, will give results correct to within two or three units in the third significant figure, an accuracy well within that of the original data. The selection of n , for instance, is an element which introduces an uncertainty largely in excess of this. Other graphic solutions of this formula have been worked out, but they nearly all involve a set of diagrams, one for each value of n . There have been none where the entire range of factors has been included as conveniently in one diagram.

SIAMESE RAILWAY AND MINERALS.

The new extension of the railway system of Siam will connect at the northern boundary of the British Protected Federated Malay States, on the east side of the peninsula, with the British line from Singapore on the south, which line has only about 150 miles yet uncompleted, and will cross the peninsula and connect with the line now completed between Penang and Singapore on the west shore. When completed, this will form a direct rail connection between Singapore and Bangkok, while a branch line of some 60 miles, which leaves the main line at Patuloong, will extend to Trang, on the west shore, and this port will be connected with the mail port of Penang, 140 miles south, by a fast line of mail steamships. The opening of these lines will serve to bring the entire peninsula into more easy touch with the markets of the world, and serve immediately to develop the resources. By this connection with the mail port of Penang, on the great eastern highway of the world's commerce, Bangkok will be brought four days nearer to Europe through mail and passenger service; and by this connection with Singapore, Bangkok in a few years will find itself on the direct through line, which is sure to furnish the outlet for the British Protected Federated Malay States on the south to British Burma and all the Indies on the north and west.

Today there is direct rail connection between Bangkok, on the east, and Karachi, on the extreme west of India, with the two following exceptions: (1) between Sawankalok in Siam and Maulmein in Burma, 170 miles; (2) between Prome, west of Rangoon, and Chittagong, both in British territory, 350 miles, already surveyed.

From Karachi to the head of the Persian Gulf, a point which the railroad from Turkey is approaching by way of Bagdad, is about 1500 miles by the gulf and land-locked sea, or by a low and level coast, for the most part, on land. The part of the peninsula

through which this road will run is one of the richest in Siam. Especially is this true of its mineral wealth. Little has been done as yet in the way of developing the country, but now Siam will have the opportunity, and it is understood that it is her purpose to open up the region by encouraging the development of its agricultural resources, and by offering inducements to foreign capital by way of mining concessions on attractive terms, to all those who are brought within the new treaty relations. In all these lines of development, perhaps that which is of most practical interest to Americans is the new impulse which will be given to the tin-mining industry. Statistics reveal that from this peninsula, with its continuation to the south, come over two-thirds of the total tin output of the world. All the deposits of importance are derived from and lie adjacent to the great line of granitic upheaval which forms the boundary range between Siam and Tennasserim, the backbone of the Malay Peninsula, and which may be traced down to the Dutch islands of Billeton, Banka, and Sengkep. This great line of granite is practically the source of all the vast alluvial deposits of tin which are found in Siam and the British, Dutch, and East Indian possessions. The Siamese territory in the north of this peninsula is probably as rich in tin as either the British or Dutch in the south, and the deposits are disseminated more or less thoroughly throughout the whole of the Siamese portion of the peninsula. As yet the west coast has produced more tin than the east, but recent developments point to the probability that the future holds quite as much in store for those who endeavor to develop the territory on the east coast.

Color of soils was discussed before the American Chemical Society recently by F. K. Cameron and W. O. Robinson. They found on making an examination of 20 typical red and yellow soils that iron oxides are the inorganic coloring matter of these soils. Manganese is present in amounts too small to contribute to the color. The variations of iron-colored soils are sometimes ascribed to the presence of different hydrates of iron oxide. From the comparatively small variation in soil temperature in near localities where the two tints are present it was reasoned that this view is incorrect, and that the iron is in much the same state of hydration. The color was shown to be due to a film of oxides of iron and aluminum, organic matter, silica, etc., surrounding the soil grains. By comparing the color of soils with the iron content and mechanical analysis, it was proved that the thickness of the film causes the variations in color, the thin film of the colored oxide causing the soil to appear yellow, while a thicker film gives a red shade to the soil. This view was confirmed by precipitating ferric hydroxide upon sands of different-sized grains and upon quartz flour, using such amounts as to keep the percentage of iron constant and vary the thickness of the film.

The term 'oil-bearing strata' is defined by the legislature of California as "any bed, seam, or stratum of rock or sand or other material which contains, includes, or yields earth oil, rock oil, or petroleum oil, or natural gas or either of them."

PHOTOGRAPHY IN MINING.

Written for the MINING AND SCIENTIFIC PRESS
By T. R. ARCHBOLD.

Referring to J. B. Landfields's paper in the issue of the MINING AND SCIENTIFIC PRESS of June 26, on the assistance photography affords in making reports on mining properties, and particularly in regard to the geological features, there are one or two instances which he did not show where a photograph may be used to reveal at a glance what would require a considerable amount of writing to make clear.

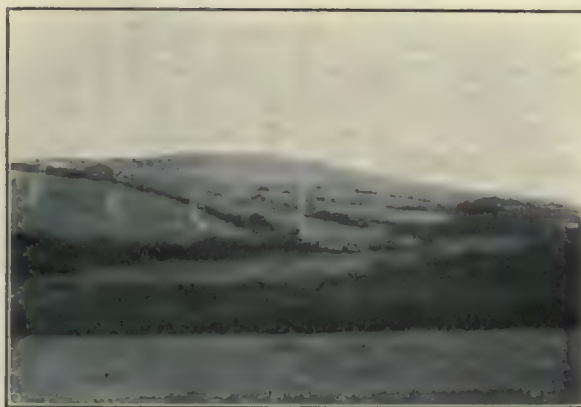
With reference to geology pure and simple; I have for some time adopted the practice of coloring the print with crayons. It is only necessary to print on a matte surface, which requires no preparation to make the crayon 'take'. I usually employ special portrait velox for sharp negatives, and carbon velox for thin ones. These being what are termed gas-light papers do not require a dark-room, and give quite as good effects as bromide papers. No artistic experi-



ence is required to rub over the various rocks or formations with a crayon, and if the result should be streaky and show the strokes of the pencil, it can be smoothed down with a piece of india rubber, to give an equal tint over the required part. It is not necessary that the color should be the actual color of the formation, but it should be distinct from the color of the adjacent rock. When a series of photographs are taken of the same occurrence, it is well to adopt one color for each rock.

Mr. Landfield advocates the use of plates where possible on account of their being easier to manipulate. I find the cut films, the 'Kodoid Plate', to be equally as good as glass plates, both for ease of manipulation and for resulting effects. They have, in common with all films, a great advantage over glass plates, namely, notes and drawings can be made on the front, which print through without the slightest blur. To do this on a glass plate would necessitate writing backward on the film. A series of photographs, such as those shown herewith, often enables the reader of a report to grasp at a glance the general trend and position of the workings, the strike and dip of the lode, and the like, and get a much clearer idea of the general situation than could be given in pages of writing. I fully endorse Mr. Landfield's advice as to the size of a camera. A 5 by 4 camera is not too bulky, and the plates are large enough in themselves

to be of practical utility. They are a convenient size to enlarge without undue expense. When possible it is better to develop the plates before leaving the locality, as the most careful photographer may make a wrong exposure from time to time, and if faulty they can be repeated. The prints are better enlarged, and to those who have not attempted it, I may say that a bromide enlargement is a simpler and easier matter than a direct print on bromide or any other paper. In making a geological section of a range of hills, for example, a simple and quick method is to project the negative on to a sheet of drawing paper, either by a lantern or by fixing the camera in a window, in the usual way adopted for enlarging with the ordinary field camera. By projecting the view on the required size of paper, the outline of the hills, and all the important points, can be outlined with a pencil, and the rocks sketched in afterward. When traveling it is well to have all chemicals, especially developer, in as concentrated a form as possible. There are many good developers on the market, but I find rodinal as satisfactory as any. It works out fairly cheaply, keeps indefinitely even after the bottle



has been opened, does equally well for plates, films, or paper, and does not stain. The proportions I use for either plates or paper are, rodinal 1 dram, 10% potassium bromide 5 drops, and water 2 ounces.

Graphite is of growing industrial importance. The fact that it is nearly pure carbon, is relatively inert chemically, and volatilizes only at high temperatures makes it of exceptional value in the manufacture of crucibles, muffles, stirring rods, etc. Most of it used for these purposes, however, is imported from Ceylon. Another important use is for lubricating. The addition of graphite to oil results in lower friction than would be obtained by the use of oil alone. The quantity of oil required is also reduced, and a lighter grade or oil of inferior quality may be employed. Graphite can also be used as a lubricant alone. The use of graphite mixed with clay for lead-pencils is well known. The more graphite and the less clay, the softer the pencil; the less graphite and the more clay, the harder the pencil. Formerly every American pencil manufacturer had to import his graphite from Bohemia or Bavaria; but about ten years ago a large deposit of amorphous graphite was discovered in Sonora, Mexico, which proved to be of excellent quality for pencil making, and the American pencil trade now relies mainly on this source. Graphite is also used for coating foundry facings.

THE ROOT POSITIVE-BLAST BLOWER.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

A silver-lead smelting-furnace 42 by 120 in. at the tuyeres, and consuming a maximum of 18% coke, requires 3250 cu. ft. of air at sea-level, on the assumption that one pound of coke requires 130 cu. ft. of air to burn it to CO₂. As the height above sea-level varies, a corresponding correction should be applied, increasing this volume. Thus, at the elevation of Leadville, there would be needed 4875 cu. ft. of air, the atmosphere having a density of but two-thirds that at the sea-level. To this must be added 25% for slip and leakage. This will add one-third to that just figured, making in all 6500 cu. ft. per minute.

- Let *w* = pounds of charge smelted per minute.
- p* = ratio of coke to charge (for 18% coke = 0.18).
- c* = pounds of air per pound of coke.
- m* = number of cubic feet per pound of air.
- v* = volume of air required per minute.
- x* = slip, and the leakage of the blast-main and at the furnace.

Then 1-*x* = loss by slip and leakage and

$$v = \frac{wpcm}{1-x} \quad \text{and} \quad w = \frac{v(1-x)}{pcm}$$

The weight of air will decrease for a specified volume, as also will the capacity of the furnace, and accordingly we will have of the above calculated weight:

| Elevation, ft. | Per cent. |
|-----------------|-----------|
| Sea-level | 100 |
| 2500 | 91.0 |
| 5000 | 82.5 |
| 7500 | 75.1 |
| 10,000 | 68.2 |

The following are data for positive-blast blowers:
The above are the maximum capacities at sea-level,

retical, not allowing for slip. (d) The diameter of the pipe-opening is such as to make a velocity of 35 to 45 ft. per second, and hence it is well to increase the diameter of the blast-main as follows. For any length of pipe up to 50 ft., make it 20% larger diameter than the blower-outlet; from 100 to 200 ft., 30% larger, and if the distance be over 200 ft., make it 50% larger. (e) The weights are those of the blower complete with pulley, and ready to set on the foundation. (f) The sizes for the corresponding furnace can only be approximate, but still suited to the blowers specified. (g) The horse-power is needed at 2 lb. for 1000 cu. ft. per minute, and is easily computed from the nominal capacity, which makes no allowance for slip. (i) The capacity of the furnace, which depends upon the pounds of coke burned per minute is calculated from formula (2), and the weight, *w*, multiplied by 1440 will give the capacity in 24 hr. The slip and leakages are assumed to equal 25%, and the fuel 20% of the charge. Ten pounds of air are taken per pound of coke, and 12.5 cu. ft. of air to the pound at sea-level. (j) The percentage of coke in regular matte-smelting may be taken at two-thirds of that used in lead-smelting, and therefore the capacity of the matting furnace is made one-half more than that of the corresponding lead furnace. It is noticed in regard to these capacities that they are maxima for the speeds given, and would be reduced for lower speeds and greater elevations, and increased by decreasing the fuel or with increased carbon-monoxide in the escaping gases.

This type of blower has been sometimes set to discharge downward instead of upward, under the idea of supporting the weight of the impeller by the back-pressure of the air. It will be noticed, however, that while the impeller lies flat, the pressure when high might approximately balance its weight, yet in the

| Number of Blower. | | | | | | |
|--|----------|----------|----------|-----------|-----------|-----------|
| | 3 | 4 | 5 | 6 | 7 | 8 |
| (a) Displacement per revolution..... | 8 | 12½ | 24½ | 42 | 67 | 100 |
| (b) Ordinary speed for constant duty..... | 350 | 200 | 175 | 150 | 125 | 100 |
| (c) Nominal capacity per minute at the above speed..... | 2,000 | 2,500 | 4,287 | 6,300 | 8,375 | 10,000 |
| (d) Diameter of discharge opening, inches..... | 12 | 14 | 16 | 20 | 24 | 30 |
| (e) Weight of blower..... | 3,000 | 5,500 | 8,400 | 12,500 | 20,000 | 27,000 |
| (f) Corresponding furnace dimensions at tuyeres, inches..... | 33 by 33 | 36 by 48 | 36 by 81 | 42 by 120 | 48 by 144 | 48 by 192 |
| (g) Horse power at 2 lb. per sq. in..... | 20 | 25 | 43 | 63 | 84 | 100 |
| (h) Horse power at 1 lb. per sq. in..... | 10 | 12½ | 21½ | 31½ | 42 | 50 |
| (i) Capacity of furnace (silver-lead)..... | 42 | 52 | 89 | 131 | 137 | 208 |
| (j) Capacity of furnace (copper-matting)..... | 63 | 78 | 136 | 196 | 250 | 317 |

and, with a pressure of 2 lb. per square inch in lead smelting (g), and of 1 lb. per square inch in copper matting (h). The sizes given are intended to cover the range of lead and copper smelting for fair sized furnaces. In connection with each size is given: (a) the theoretical amount of air displaced and propelled forward at each revolution of the driving pulley. In this no allowance is made for 'slip', or leakage of air backward. Since the surfaces or joints are those of rolling contact, such loss by slip is considerable, especially at high pressures and leakages with the pressure carried. In a large blower the length of such joints may be 20 to 30 ft., and cannot fail to cause some slip. As at present made, however, the joints, or surfaces of contact, are extended, so that leakage is minimized. (b) While the speeds given in the table are the ordinary ones for constant duty, they can be increased to deliver air much in excess of that specified. (c) The capacity given is the theo-

vertical position it would be about one-third only of what it would be when flat, thus causing serious variations of pressure upon the bearings. With upward discharge a similar variation occurs, but it would be in the direction of gravity, so that the percentage variation would be less. It would seem to be well to conform to ordinary practice, which favors upward discharge, and certainly promotes quiet and regular running.

It is well to cover the suction-openings with coarse wire-netting to prevent the entrance of foreign objects into the blower. This precaution is, however, often neglected.

Foundations of a blower generally include a pit underneath, intended to permit a freer entry of air, and to make the machine more accessible for examination. It will be observed that, even if the precaution be neglected, there still remains a sufficient space for the entrance of the air.

HORNSILVER DISTRICT, NEVADA.

By F. L. RANSOME.

*The town of Hornsilver, which came into existence in 1907, lies in Esmeralda county, Nevada, 26 miles south-southwest of Goldfield, 14 miles south-west of Cuprite, a station on the Las Vegas & Tonopah and the Tonopah & Tidewater railroads, and 12 miles southeast of Lida. Mining in this vicinity is not wholly recent, and an earlier settlement on the site of Hornsilver was known as Lime Point. Prospecting of this region began about 1868, and over 20 years ago ore was hauled to a mill near Lida from the Grand Central and other claims near Lime Point; but most of these claims had long been abandoned when the growth of Tonopah and Goldfield called attention anew to this part of Nevada and provided better facilities than formerly existed for its economic development. Work on the Great Western vein began in 1905, and the Grand Central was relocated early in 1908, after the presence of rich ore in the Great Western had been established. The following notes are based on a visit of a day's duration in June 1908. At that time there were about 500 people in the district and considerable prospecting was in progress in the hills west and south of the town. Water was hauled from a spring 12 miles away and supplies were brought from Goldfield by wagons or partly by rail by way of Cuprite. One mine only, the Great Western, was shipping ore.

Hornsilver, at an altitude of 5900 ft., lies on a gentle alluvial slope, which opens northward into one of the broad desert valleys of the region and is inclosed on other sides by hills rising from 500 to 1000 ft. above the town. The rocks of the district are limestone and calcereous shales, which are intruded and in places more or less metamorphosed by masses of granite. The stratified rocks are mapped by S. H. Ball¹ on his reconnaissance map as the Prospect Mountain limestone,² of Cambrian age. He described briefly³ the rocks of Slate Ridge, south of the new town, and shows that these old stratified rocks are continuous with the more metamorphosed beds at Tokop and Gold Mountain, southeast of that ridge. Near Hornsilver some shale is interbedded with the limestone, but a considerable thickness of shale with subordinate calcereous beds underlies fairly massive limestone, which is exposed in the hills south and east of town. The ores lie mainly in these shales.

The principal veins are southwest of town, within a distance of a mile. They constitute an approximately parallel system and cut across the bedding of the shales with a prevailing strike of N. 55° to 66° W. and with steep dips. Although the wall rock is generally shale, the veins are parallel to some fine-grained and rather obscurely exposed dioritic dikes. The two principal veins are the Great Western and Grand Central, which are about a quarter of a mile

apart, the Grand Central being the farther from town. These have been traced by trenches and pits for distances of 3000 to 4000 ft. along their not very conspicuous outcrops. There are also three or four other veins on which less work has been done. All of the vein material that could be seen in 1908 was thoroughly oxidized and for the most part soft. The fissures after being filled with quartz and sulphides evidently had been crushed by later movement along the original dislocation and the vein was thereby rendered permeable to oxidizing solutions. The valuable constituents are native gold and chloride of silver.

The Great Western mine at the time of visit was developed to a depth of 200 ft. and equipped with a 15-hp. gasoline hoist. The 100-ft. level was about 600 ft. long and the 200-ft. level about 175 ft. long. Since that time a 300-ft. level has been opened. The gross product of the mine in June 1908 was, according to the owners, between \$30,000 and \$40,000, the shipments ranging in assay value from \$75 to \$400 per ton. The Great Western vein strikes N. 60° W. and near the shaft dips 50° N.E. At the northwest end of the 100-ft. level, however, the vein is nearly vertical. There is a very regular and persistent hanging wall with a thin skin of soft gouge separating ore from country rock. The vein is in some places about 20 ft. wide and consists of the usual crushed rusty quartz found in the veins of this district. Much of this material is said to yield assays of about \$30 per ton, but only the higher-grade portions have been stoped. The ore from these portions shows abundant cerargyrite as sparkling olive-green crusts on the rusty quartz fragments and as small crystals in spongy limonitic material residual from the oxidation of the original sulphides. Minute quantities of a bluish-green mineral in thin crystalline rosettes associated with the cerargyrite are probably embolite or bromyrite, but have not been chemically tested. The ore shipped in 1908 contained relatively little gold; not more than 15% of the total value of the precious metals present. Recent reports, however, indicate that ore with a much higher proportion of gold has been stoped in the northwestern part of the 200-ft. level. A second vein has been cut near the shaft on the 100-ft. level, samples from which are said to contain more gold than silver. It had not been stoped at the time of visit. In January 1909 the mine was reported to be shipping 12 tons of ore per day by way of Cuprite.

A short distance southeast of the Great Western mine the vein passes under alluvial material and little is known of its extent or value in that direction. It has been traced northwestward, however, for 3000 ft. or more, and several sets of lessees were engaged in 1908 in exploring this vein or others in the same general zone of fissuring. No work was in progress on the Grand Central vein in June 1908, although some shipments have since been reported in the mining press.

About 1½ miles due south of Hornsilver, on the other side of the limestone ridge (Slate Ridge), which separates the town from a small arm of Death valley, known as Oriental Wash, is the Redemption mine, worked superficially many years ago and recently re-opened by lessees.

*Abstract from Contributions to Economic Geology, 1908. Bull. 380, U. S. Geological Survey.

¹A geologic reconnaissance in southwestern Nevada and eastern California: Bull. U. S. Geol. Survey No. 308, 1907, Pl. I. ²Now known as the Eldorado limestone. ³Op. cit., pp. 182-195.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Eclogite is a metamorphic rock consisting mainly of red garnet, augite, quartz, hornblende, and kyanite, the relative abundance being in the order named.

Granulite is a crystalline rock occurring associated with gneisses, supposed to be altered from an igneous rock. Granulite usually contains an excess of orthoclase, with quartz, garnet, and mica. When pyroxene is the predominant mineral it is called pyroxene-granulite.

Choke-damp is the gas resulting from the explosive combustion of 'fire-damp', that is, a mixture of various hydro-carbons evolved from coal. The 'choke-damp' is mainly carbon dioxide, although some carbon monoxide may also be formed, depending upon the proportion of hydro-carbons in the atmosphere of the mine at the time of explosion.

Turquoise has no steady market at a fixed price. Owing to its variation in quality fixedness of value would be impossible. Average turquoise contains only about 10% of the mineral of a grade suitable for even crude jewelry. Such material commands about 25c. per pound in the Eastern markets. Better grade rock will bring as much as \$3 per pound. High-grade rock, of true robin's-egg blue, sells by the piece, according to size and quality.

Kyanite or cyanite (a name derived from the Greek *Kyanos*, dark-blue) is a basic metasilicate of alumina. It occurs chiefly in gneiss and in mica schist, and was evidently formed at a moderate temperature, since on heating it above 1300°C. it is changed to fibrolite. It is only accessory mineral in rocks, though it is characteristic of some of them, as for instance the granulites. Fine specimens have a value as gems, but these are rare. Its specific gravity is 3.56 to 3.6, and its hardness 5 to 7. It is blue, white, gray, green, and even black. It is often associated with corundum.

Check-holes in placer-drilling cannot necessarily serve to make an actual check upon the individual holes previously drilled, but as a means for proving whether the value of the placer-ground as a whole was accurately estimated. If desired to follow closely the results of the original driller the check-holes may be placed close to the earlier ones. There is danger, however, of obtaining false results in the check-holes if placed only a few feet distant, owing to possible disturbance of the ground through boulders which had been pushed out of the path of the casing. The original driller may have obtained extravagant results by sand running in from the sides, in which case the original sample would be too high and the check-sample too low. In general it may be said that the check-holes should be as much as 5 to 10 ft. distant to be wholly reliable.

Roads built upon a mining claim which can be shown to be a necessary convenience for development of the contained mineral-deposits are accepted

as assessment work. Any buildings which are distinctly required for mining operations, such as hoist-engine house, blacksmith shop, and the like, will also apply, but dwelling houses do not. Such structures, built for the personal convenience of a claimant will, however, possess value as evidence of good faith in case of dispute over ownership.

Bromo-cyanidation is not at present practiced in the United States or Mexico. It was used successfully on an arsenical gold ore at Del Oro, near Marmora, Ontario, for many years, the ore consisting almost wholly of quartz and arsenopyrite, the gold being associated chiefly with the mispickel. The process consisted in stamp-milling, with amalgamation, concentration by jigs and Wilfley tables, with subsequent bromo-cyanidation of the concentrate. The latter was then roasted in revolving cylinder-roasters to recover the arsenic, which was refined on the spot. The cinder after roasting, containing ferric oxide and silica, assayed about \$4 gold per ton.

Mica is a general name for a large group of minerals of which only two, however, are of any considerable economic importance. These are muscovite, the potassium mica, and phlogopite, a magnesium, nearly iron-free mica. The first is known in the trade as 'white mica', and the second as 'amber mica'. Muscovite occurs in quantity and is mined at various points in the United States. Phlogopite is generally imported, being derived from Canada and Ceylon. It is in especial demand for insulation between copper bars of commutator segments. The 'amber mica' wears down evenly with the copper segments, while ordinary or muscovite mica does not wear down so rapidly and is left in ridges above the copper, causing the motor to spark. The principal use of all the micas is in the manufacture of electrical apparatus. Many forms of dynamos, motors, induction apparatus using high voltage, switchboards, lamp sockets, etc., contain sheet mica. Much of the mica used in electrical apparatus is first made up into large sheets of mica board or 'micanite'. Considerable of the finest grades of mica is used in making windows for coal, gas, and oil stoves, lamp shades, decorated boxes. Scrap and ground mica are used in the manufacture of wall papers, lubricants, fancy paints, and, mixed with shellac, in making molded insulators for wires carrying high potential currents. The large electric companies mainly control their own supply. The Westinghouse company has mines in South Dakota. In 1908 the production of sheet mica in the United States was 972,964 lb., valued at \$234,021; scrap mica 2417 lb., \$33,904. Prices of selected sheets in New York ranged from 87c. for the 2 by 2-in. size to \$6.75 for 6 by 8-in. Imports were 548,373 lb., with a total value of \$266,058. Canada produced 580,195 lb., valued at \$198,839, in the same year, and Ceylon, 42,600 lb., worth \$4935, in 1907. Both production and imports in the United States were below normal in 1908, owing to the depression of the manufacturing industry. The duty on manufactured or rough mica is 5c. per pound and 20% ad valorem; on mica cut or trimmed, mica in plates or manufactured forms, 10c. per lb. and 20% ad valorem.

American Mining Congress Program.

The following is the advance program of the Twelfth Annual Session of the American Mining Congress, Goldfield, Nevada, September 27 to 30, and October 1 and 2, 1909.

The convention will be called to order at 2 o'clock p. m. in the Hippodrome, corner Columbia Ave. and Miner St., by Joseph H. Hutchinson, chairman of local executive committee.

Invocation, Rev. James B. Dermody.

Address of Welcome, Charles S. Sprague.

Address of Welcome, George D. Pyne.

Address of Welcome, Denver S. Dickerson, Governor of Nevada.

Response by J. H. Richards.

Five minute responses as follows:

Alaska—Charles Estmere.

Arizona—F. J. Elliott.

Arkansas—A. W. Estes.

Canada—H. H. Lang.

California—E. H. Benjamin.

Colorado—E. A. Colburn.

Illinois—J. A. Ede.

Idaho—Harry L. Day.

Kansas—T. J. Vest.

Missouri—E. R. Buckley.

Mexico—P. J. Tehaney.

Montana—F. H. Cooney.

Nebraska—George W. E. Dorsey.

New Mexico—Arthur K. Adams.

Oklahoma—C. N. Gould.

Oregon—J. Frank Watson.

Ohio—C. O. Bartlett.

Pennsylvania—Samuel A. Taylor.

South Dakota—T. J. Grier.

Texas—M. B. Parker.

Utah—John Dern.

Washington—L. K. Armstrong.

West Virginia—H. M. Payne.

Wisconsin—E. C. Holden.

Wyoming—M. N. Grant.

Report of Committee on General Revision of Mining Laws: W. R. Ingalls, New York City.

Report of Committee on Standardization of Electrical Equipment Used in Mines: Edward B. Rosa, Washington, D. C.

Report of Committee on Revision of Alaskan Mining Laws: J. L. Steele, Landlock, Alaska.

Report of Committee on Vertical Side Line Law: George W. Riter, Salt Lake City, Utah.

Report of Committee on Coal Tax Insurance Fund: Samuel A. Taylor, Pittsburg, Pennsylvania.

Report of Committee on Prevention of Mine Accidents: H. H. Stoek, Scranton, Pennsylvania.

Report of Committee on the National Forest Service: A. G. Brownlee, Denver, Colorado.

Address: Francis G. Newlands, Senator from Nevada.

Address: Charles Dick, Senator from Ohio.

Address: George A. Bartlett, Congressman from Nevada.

The Mines of Nevada: E. E. Stuart, State Inspector of Mines, Carson City, Nevada.

The Round Mountain District: J. P. Loftus, Goldfield, Nevada.

The Purchase of Coal by the B. T. U. Method and Some Practical Questions in Connection Therewith: Samuel A. Taylor, Pittsburg, Pennsylvania.

Comstock Days: William C. Ralston, San Francisco, California.

The Zinc Mines of Southern Nevada: Douglas White, Los Angeles, California.

The Bullfrog District: Clay Tallman, Rhyolite, Nevada.

The Ely District: Samuel Belford, Ely, Nevada.

Pioneer Mines: Oscar J. Smith, Reno, Nevada.

Mining in Alaska: James Wickersham, Fairbanks, Alaska.

The Manhattan District: C. R. Evans, Manhattan, Nevada.

Application of Steel in Mining Operations: R. B. Woodworth, Pittsburg, Pennsylvania.

The Mining Man's Interest in Land Classification: George Otis Smith, Director U. S. Geological Survey, Washington.
Smelter Rates: James H. Fox, Seattle, Washington.

The Paralysis of Mining Districts: E. B. Kirby, St. Louis, Missouri.

Electricity—Its Relation to the Mining Industry (illustrated with lantern slides): I. B. Potter, Goldfield, Nevada.

A Federal Bureau of Mines: D. W. Brunton, Denver, Colorado; W. F. Englebright, Nevada City, California.

Recent Developments in the Production of Copper: Samuel Newhouse, Salt Lake City, Utah.

The Need of a National Laboratory for Research in the Domain of Operative Mining: Thomas F. Walsh, Denver, Colorado.

The Future of the Copper Mining Industry: H. J. Stevens, Houghton, Michigan.

The Movement for Greater Safety and Efficiency in Mining (illustrated with lantern slides): J. A. Holmes, Washington, D. C.

Federal Land Policies as they Affect the Mining Industry: W. B. Heyburn, Senator from Idaho; Reed Smoot, Senator from Utah; George Chamberlain, Senator from Oregon.

Mine Inspection: Courtenay De Kalb, San Francisco, California; Harry Lee, Salt Lake City, Utah; Joseph A. Holmes, Washington, D. C.

Means for Bringing about a Greater Use of Silver with a View to Reducing the Rate of Exchange between this and Silver Using Countries to the End that Oriental Markets may be Opened to American Manufactured Goods: Moreton Frewen, London, England; James J. Hill, St. Paul, Minnesota; John Hays Hammond, New York City; C. C. Goodwin, Salt Lake City, Utah; A. Heckman, New York City.

Insurance and Mine Accidents: Samuel A. Taylor, Pittsburg, Pennsylvania; Glenn W. Traer, Chicago, Illinois; John H. Jones, Pittsburg, Pennsylvania; David Ross, Springfield, Illinois.

The Mining Stock Exchange as a factor in the development of the Mining Industry: A. B. Ruggles, San Francisco.

Mining as the Basis of National Wealth and the Growth of Modern Cities, Herman Zadig, San Francisco, California.

The sessions of the Congress will be held in the Hippodrome, corner Columbia Ave. and Miner St., three blocks north from the Goldfield Hotel, which will be the headquarters of the delegates.

The Mineral Palace, corner of Main and Miner St., contains a most comprehensive and typical exhibit of the minerals of Nevada and a few smaller exhibits from adjoining States. The formal opening of the Mineral Palace will take place on the first day of the convention.

Wednesday, September 29, will be spent at Tonopah, Nevada, to which a special train will convey the delegates, leaving Goldfield at 8:30 a. m., stopping for an inspection of the large stamp-mill at Millers Station and the larger mines of the Tonopah district. At 3:30 a business session will be held at which the general subject of mine inspection will be discussed. A short business session will be held in the evening, after which the special train will return with the delegates to Goldfield.

It is planned to devote the greater part of Tuesday to a discussion of the silver question; Thursday to the question of General Revision of Mining Laws; Friday to the Land Policies of the Federal Government as they affect the Mining Industry, and it is proposed to devote whatever time may be necessary for a thorough discussion of these subjects. Technical and descriptive papers will take second place to the practical discussion of live subjects upon which the action of the Congress is expected. Saturday will be California Day, in which special delegations from that State will participate. The Congress will be officially adjourned at noon on Saturday, after which an opportunity will be given to examine the mines and mills of the district.

The Goldfield Entertainment Committee will provide entertainment for every moment not otherwise occupied, but will not interfere with the regular business sessions of the Congress. Provisions have been made for a rock-drilling contest open to the world on Saturday afternoon, and for a street carnival to be known as 'The Malapai Mixup,' on Saturday evening.

Publications Received.

*Any of the books noticed in these columns are for sale by or can be procured from, the MINING AND SCIENTIFIC PRESS.

BENEFICIO DE METALES DE PLATA Y ORO POR CIANURACION.
By Ferdinand McCann. 8vo., pp. 404, ill., index. Published by the author, 1909. Price \$5 U. S. Cy.

Technical treatises in Spanish, dealing with the latest advances in metallurgy are few, and each one that appears commands particular attention. It is peculiarly fitting to have a manual of cyanide practice emanating from Mexico. The sudden looming up of an adaptation of cyanidation to silver ores in Mexico has developed a new phase of the art. It seems strange that for so many years the presence of silver in considerable quantity in an ore had been deemed a deterrent against cyanidation, whereas today this solvent has revolutionized the metallurgy of complex silver ores. The three cardinal points, of course, are fine grinding, sufficient strength of the solution, and economical methods of agitation. While the Pachuca tank was not invented until recently, the air-lift and the tube-mill were available 15 years ago, and a tube-mill was specified for a Mexican silver plant as early as 1898, but was left out because of the timidity of the mine-owners. The development of the Mexican cyanide practice was a case of evolution; the time was ripe for the adoption of the several means that would lead to the desired economic end, and the ideas cropped up suddenly in so many places that it is evident that the winds of progress had widely scattered the spores; squabbling over priority is therefore of little avail. Mr. McCann has essayed a chronology of the cyanide process, which would be interesting if verified; it is the one part of his book which we would criticise adversely; it can do no good, and the vacuum process has developed acute neuropathic symptoms among a considerable group of otherwise healthy gentlemen. The treatise before us is not a book made just to sell; it is a serious manual, entering into all the details of theory and technology, written exclusively in the Spanish language. A feature of the work which is of special interest is a series of nine chapters devoted to details of practice at the leading Mexican plants, such as Dos Estrellas, El Oro, Esperanza, Guanajuato Consolidated, Real del Monte, Coscotitlán, San Rafael y Anezas, and others. These chapters are very complete, and give consumption of supplies and costs distributed in many cases to the various operations in great detail. There is a large folded table giving such minutiae, in comparison with Black Hills practice, prepared by W. E. Hindry. Favorable comment is made, and much space given, to the electric precipitation process of S. B. Christy, accompanied with the explanation that as the double cyanide of zinc and potassium is not a good solvent for silver, electric precipitation offers a hopeful means of avoiding the introduction of zinc into the solution. An appendix gives an elaborate conversion-table for ounces into kilograms, from 1 oz. to 1000, together with a conversion-table for Troy ounces per avoirdupois ton to grains per metric ton, and vice versa. The book is valuable for the new and interesting data it contains, and will be particularly useful to those desiring an acquaintance with all the terms applicable to this industry as an aid in superintendence of Spanish-speaking assistants.

It is likely that a plant for the extraction of minerals by a chemical process will be erected in Butte. The inventor is Charles S. Bradley, of New York. Albert C. Burrage, of Boston, an Amalgamated Copper company director, is associated with him and is financing the project. Mr. Burrage and Mr. Bradley were in Anaconda last week to make an inspection of the leaching process used by the Amalgamated company in treating the tailing dump at the Washoe smelter. The Amalgamated is able to save only about 80% of the mineral content of the Butte ores and 20% is lost with the tailing, of which there are millions of tons about the big Washoe smelter. The company is trying to save some of this mineral by a leaching process but, it is understood, is able to recover only about half. Bradley and

Burrage shipped a carload of the tailing to a small chemical plant they are operating in the East and claim to have saved 90%. They are now trying to get a contract from the Amalgamated company for the exclusive right to handle the Washoe tailing.

A New Muffle-Furnace.

A compact, self-contained, and convenient muffle-furnace, using gas for fuel, has recently been put on the market by the Denver Fire Clay Co., Denver and Salt Lake. It will appeal to assayers because of the fact that it is possible to maintain a uniform heat as high as 2100°F. with a gas consumption of only 150 cu. ft. per hour. The furnace is supplied with the Case patented gas-burner, enabling any



kind of illuminating gas to be utilized. The blast is supplied by a small fan direct-connected to an electric motor, which latter consumes about as much energy as a 16-candle-power lamp. The muffle is 10 by 16 in., and will hold fifteen 20-gram crucibles. It may be removed and replaced without disturbing any other parts. The company has issued Bulletin No. 26, describing this furnace, which it will send to any address.

Commercial Paragraphs.

The LUCAS PUMP Co., Dayton, Ohio, has elected John W. Good treasurer, to succeed R. E. de Weese, resigned.

The ALLIS-CHALMERS Co., Milwaukee, has received a contract for a large pumping engine to supply water for the city of Wheeling, West Virginia. It is to be of the triple-expansion, crank and fly-wheel type, and will have a capacity of 20,000,000 gal. per day. The low-pressure cylinder will be 110 in. diam. and have a 72-in. stroke. The total weight of the engine will be over 1100 tons.

THE GALIGHER MACHINERY Co. is, as was briefly noted in this column last week, the new name of the Utah Mining Machinery & Supply Co., of Salt Lake City, Utah. The company was organized in 1902 with a capitalization of \$100,000. With the re-organization which is effective September 9 the capitalization is increased to \$600,000, one-half of which is preferred stock and the other one-half common stock. The officers of the new company are the same as those of the old, that is, E. F. Holmes president, J. E. Galigher vice-president and general manager, W. W. Armstrong treasurer, and A. J. Lowe secretary.

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TABLE OF CONTENTS.

| | |
|---|----------------------|
| EDITORIAL: | Page. |
| Notes | 437 |
| American Institute Meeting | 438 |
| The Mining Magazine | 439 |
| Alaskan Railways | 439 |
| GENERAL MINING NEWS..... | 441 |
| SPECIAL CORRESPONDENCE..... | 446 |
| CONCENTRATES | 474 |
| DISCUSSION: | |
| Dredging on the Fraser River..... | John Watt 452 |
| ARTICLES: | |
| Modern Progress in Mining and Metallurgy in the Western United States..... | David W. Brunton 453 |
| Gas Engines | Mark R. Lamb 459 |
| Application of Steel to Mine Timbering..... | R. B. Woodworth 462 |
| Paralysis of Mining Districts.... | Edmund B. Kirby 467 |
| Deflecting Angles with a 30-ft. Tape.... | Lee Fraser 470 |
| Cyaniding Concentrate at Taracol, Korea..... | J. D. Hubbard 471 |
| Wire-Rope Sockets | 475 |
| New Inverted-Type Assay Balance..... | 475 |
| Uses and Limitations of Electrolytic Amalgama- tion..... | J. H. Jory 476 |
| DEPARTMENTS: | |
| Personal | 440 |
| Market Reports | 440 |
| Prospector | 461 |
| Publications Received | 475 |
| Catalogues Received | 475 |
| Commercial Paragraphs | 476 |

EDITORIAL.

RECENTLY a convention was held in Sacramento to consider the damage alleged to be done to streams and riparian farms by dredging on certain central California rivers. A committee was appointed, consisting of Messrs E. B. Edson of Knight's Landing, Jesse Poundstone of Grimes, Louis Tarke of West Butte, William Beckman of Sacramento, H. H. Dunning of Marysville, and Dr. B. Caldwell of Biggs, to investigate. The finding of the committee fails to sustain the contention of damage from dredge-tailing as the work is now conducted—even the dredgers on the Yuba river, that had been severely criticised are released from blame. In conjunction with the testimony of Captain Jackson and other engineers of the Débris Commission, this report should terminate agitation against the dredge operators in California.

THE COLORADO School of Mines, at Golden, Colorado, has prepared plans for an experimental ore-dressing and metallurgical laboratory, suitable both for instruction and for commercial testing of ores. The plant will be promptly erected, and will serve a most useful purpose. From the design it appears that a great range of work will be possible. Apparatus representing different types and methods will be provided, so as to illustrate varying principles. We note that the ordinary stamp battery is supplemented by Nissen stamps; that rigid and spring-rolls stand side by side; that eight different forms of table and belt concentrators are included; that a portion of the mill is set apart for dry concentration; and that there is an elaborate cyanide division, including a tube-mill. Congratulations are due to Mr. Victor C. Alderson, president of the School of Mines, for the efforts which he has made to provide that institution with so practical an addition. It will mean much for the efficiency of the school, and will benefit the State in high degree.

COMPLIMENTARY and well deserved resolutions were passed by the Board of Geological Survey of Michigan on the occasion of the recent resignation of Mr. A. C. Lane, for twenty years State Geologist. It was pointed out that Mr. Lane's administration had been unprecedented in length and unparalleled in the number of reports published. And that it had furthermore been marked by uninterrupted harmony. Twenty years is a long time in the professional work of one man though a short one in the industrial history of a State. It speaks well for the State Survey that in that period new copper lodes have been located, coal production has increased from 50,000 tons to 1,500,000 annually, rock salt has come to be mined, and the soda mineral

water, limestone, cement, and clay industries have greatly expanded. A mere recital of the progress attained is an excellent argument, if one be needed, for geological surveys, as well as a tribute to the retiring State Geologist. Mr. R. C. Allen, who succeeds to the position, is a younger and less well-known man, but one of excellent training and reputation. The Michigan survey has been served by some of the best American geologists, Alexander Winchell, T. B. Brooks, Raphael Pumpelly, Carl Rommiger, C. T. Wright, and others. It has contributed substantially to science as well as to the development of the State.

IN the shadow of death from an accident, emphasizing the peculiar perils of the miner's life, the American Mining Congress began its twelfth annual session at Goldfield. By a sudden collapse of the Hampton stope of the Goldfield Consolidated mine, three men were entombed, and strenuous deeds of rescue-work were witnessed, too late, as it happened, to be of any avail. A drift was driven through solid rock a distance of 35 feet in 36 hours—a marvellous achievement. The rescuers 'worked like demons', so run the reports, not even pausing to allow the powder-smoke to clear away, and handling the broken rock by shovels, disdaining the use of cars. Such ardor is beautiful; it is inspiring; it deserves praise; it is right! It is an expression of universal brotherhood; yet in the face of these earnest efforts to relieve those who are in peril of death, the thought comes that a little more sympathy and sacrifice to help those who live and move among their fellows entombed in misery that crushes their hearts, would be a still more inspiring spectacle. There is a certain irony in these sudden enthusiasms of human effort to just save a man physically alive—but we have to call them heroic.

GROWING out of a trivial dispute, which a little tact might easily have averted, a labor strike suddenly flashed upon Butte, Montana, momentarily threatening to tie up all the great mines, and to shut off the supply of ore from the smelters at Anaconda and Great Falls. On Friday of last week only twenty per cent of the mines were working, and the inevitable 'gun' in the hands of reckless enthusiasts was menacing the peace of the community. A majority of one of the Engineers' Unions seceded from the Western Federation of Miners and organized an independent association. The answer to this gage was the refusal of the miners belonging to the Western Federation to work in mines employing the secessionist engineers. The strike was settled on Monday by capitulation on the part of the engineers. The difficulty was unique in that no question was at issue between the workmen and the mine-owners. It was a family broil, now happily concluded without precipitating a costly and disastrous closure of the great industry on which Butte depends. The mine-operators of Butte have long shown peculiar consideration to their operatives. To have caused financial embarrassment through inability to adjust their own differences, the workers might have sacrificed the advantages they had previously gained.

ELECTRICITY is being more and more substituted for steam in mining operations, and in many situations notable economies result. At the Butte-Balaklava the saving is estimated at more than 60 per cent. At the Tucson mine in Leadville it is reported at over 70. These great savings are possible because of the high cost of steam in isolated plants. In Colorado, temporarily, there is more power available than the market demands. The completion of the Shoshone plant and the building of transmission lines of the Central Colorado Power Company has made electric power available in Lake, Summit, Clear Creek, and Gilpin counties at a time when for various reasons mining is less active than usual. The cheapness of the new power is a not unimportant influence in the mining revival which is beginning in these old districts. Incidentally it is interesting to know that a recent comparison of rates shows that, for the smaller installations, this electricity developed by water power and transmitted a hundred miles or so across the mountains is being sold at approximately the same rates as by the Commonwealth-Edison Company in Chicago, where the electricity is steam-generated from coal hauled a hundred miles across the prairies. This is one way of removing mountains.

American Institute Meeting.

Not often is it possible for the members attending a session of the American Institute of Mining Engineers to pass in review so large a number of interesting mining and metallurgical centres as upon the itinerary connected with the ninety-seventh meeting held at Spokane, Washington, September 27 to 30. In the West the party is enabled to visit Butte, Anaconda, Wardner, Spokane, Seattle, Tacoma, Salt Lake City, Tintic, and Pueblo. A more varied program for men interested in mines and smelting would be difficult to arrange. The subjects for discussion at this meeting are of peculiar value. We have pleasure in publishing an abstract of the presidential address by Mr. D. W. Brunton, in this issue. It is one of those eminently useful papers in which a man competent to measure the present state of the art gives a picture of progress. We note with interest that the question of professional ethics, which we have so strenuously insisted upon, will come forward for consideration. The American Institute of Mining Engineers has deliberately held aloof from formal pronouncement upon all problems, technical and general. The judgment of the venerable and distinguished leader of the Institute, Mr. Rossiter W. Raymond, is against such procedure, and that field of usefulness is therefore closed to the society. We have threshed out this straw with Mr. Raymond in the past, and we are convinced that he has made up his mind to have his way about it. We are sorry, for, if he only knew it, we see so many ways in which the Institute might have blazed the path toward higher ideals—and Mr. Raymond excels in ideals—and have guided the profession by an authority whose fiat would have been recognized. The present meeting will be a memorable one in many ways. It is perhaps another heresy to suggest that the Institute and the American Mining Congress, both meeting on identical dates in

Spokane and Goldfield respectively, might have bowed to each other—just a stiff, distant, little nod, if nothing more. Each might thereby have been the gainer.

The Mining Magazine.

The first number of a new monthly periodical, THE MINING MAGAZINE, edited and published in London by Mr. T. A. Rickard, in co-operation with Mr. Edgar Rickard, has just reached us. It is a handsome magazine in every feature. Typographically it is a model of excellence, being printed on high-grade paper, in 10-point machine-set type, and illustrated with handsome engravings. The high character of Mr. Rickard's editing is well known; it has set a world-standard for technical periodicals, intolerant of inaccurate phraseology and clumsy style. He brings experience, gained by long and thoughtful editing of two of the greatest technical periodicals in the world, to the founding of THE MINING MAGAZINE, which occupies a field where it will have no rival. It is devoted to mining as a profession, not to mining as a stock-gambling game. Announcement of the complete detachment of the staff from stock ownership and speculation is frankly and unequivocally made. As always, Mr. Rickard proposes to conserve his independence, and to maintain untrammelled freedom of speech in the interest of the public whom he serves through honest journalism. The new magazine is strong, as might be expected, in its editorial utterances; it is also notable for peculiar breadth and interest in its special correspondence; the articles cover a range of metallurgical and engineering subjects swinging from the Royal Mint in England to South Africa, Australia, America, Spain. The famous Blériot aeroplane is illustrated; Mr. Henry F. Collins supplies a timely paper on 'Sintering of Copper Ores', and Mr. T. Lane Carter tells of metallurgical practice on the Rand. Large space is devoted to company reports; and a review of technologic advance is a welcome feature. The metal markets of the month are reviewed in a manner that casts light before as well as behind; even the man with an opinion has arrived to open 'Discussion' in this initial issue. We may be pardoned for expressing pride in this enterprise, which, if not our child, at least belongs in the family and wears our tartan.

Alaskan Railways.

Railway construction in Alaska is making good progress. Officials of the Copper River road, running from Cordova inland, expect to handle shipments from the Bonanza mine by a combined rail and boat-line this autumn. The Alaska Central, at Seward, is going ahead after a three years' wait. Construction as far as Turnagain Arm is under contract, and expected to be finished by October 15.

Construction in the north is proving to be unexpectedly expensive and harbor problems are proving by no means negligible. It is currently estimated that the Guggenheims are spending a million dollars on their hundred-mile line to the coal-fields. While there is little doubt as to the ultimate utility of these Alaska lines, their immediate future is not certain. It is difficult to see from what source, for

some time at least, sufficient freight will come to pay interest and dividends. Metal mining will necessarily develop slowly. While there is an abundance of excellent coal to be transported the land laws have not been such as to permit of the honest acquirement of tracts large enough to give any single road a monopoly, or even a dominant position. Out of the situation ugly scandals have grown, and much anxiety has come to those attempting to open the country. It is, however, one of the facts which enter into the situation.

Difficulties as to markets also exist. There is no large local demand for coal, and the Pacific Coast cities do not afford an attractive field for coal-selling. British Columbia and Puget sound ports are well supplied from local sources. California has come to depend so exclusively on oil that the market for coal has nearly disappeared. While prices paid are high it would take but a small quantity of coal to break the market. In actual operation approximately three and a half barrels of California oil equal one ton of good coal. There are existing contracts for oil as low as 19 cents per barrel. Most of the oil is now sold at 80 cents to a dollar. Assuming the latter price for the future, coal would need to be delivered at California points at \$3.50 per ton to compete on price alone, and when the many incidental advantages of oil for fuel are taken into account it is evident that coal can not be substituted for it in any large way until the oil fields begin to show signs of exhaustion. When that will come no one may safely predict, but to all appearances it will not be in the immediate future. Coal is sold in California and in the markets supplied from California ports, to small users only, people who do not discriminate as to differences in quality. There is therefore less than the usual opportunity to introduce Alaskan coal on the basis of quality.

Probably the largest immediate market will be afforded by the railways themselves, but an industry, no more than a man, can lift itself by its bootstraps. The steamers running to Alaskan ports will hereafter need only to carry coal on the outbound trip, and can use the Alaskan product coming back. All this, however, will afford but a small market, and the roads as well as the coal mines must depend for their ultimate profit on upbuilding local industries. Fortunately the opportunities for this are good. The recent discovery of apparently valuable gold-quartz veins in the placer districts back of Seward is important and the continued development of the copper deposits even more so. With proper laws, and proper attention, fishing, lumbering, and agriculture, may all come to contribute important amounts of freight, but railway building in Alaska is necessarily pioneer work. It has been in pioneer railway building, however, that Americans have been most successful. A marked characteristic of America's industrial history has been the fact that railways have been built to develop a region rather than to afford an outlet for existing industries. While the way has been strewn with wrecks the results have justified the procedure, and similar results will probably in time justify the building of the Alaskan roads.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

R. C. SHAW is in Los Angeles.
 M. B. HOLT is in New York City.
 ROBERT MITCHELL is in San Francisco.
 A. J. ROBIN is at Cherry Creek, Nevada.
 T. B. BEADLE is in Winnemucca, Nevada.
 EMMET D. BOYLE is in Silver City, Nevada.
 R. H. YOUNG is in East Auburn, California.
 HORACE F. EVANS is visiting San Francisco.
 W. P. CATLIN has removed to Reno, Nevada.
 L. C. TRENT, of Salt Lake, is in San Francisco.
 GERALD GALT has gone to Winnipeg, Manitoba.
 R. J. HAWKE has come to San Jose, California.
 C. A. BOYLE has gone to La Grange, California.
 F. G. LASIER has gone to Crescent City, Florida.
 ALGERNON DEL MAR has gone to Granite, Oregon.
 W. A. ROWLAND has gone to El Portal, California.
 STEWART BLACKBURN has gone to Victor, Colorado.
 J. F. STAYER has gone to Idaho Springs, Colorado.
 T. K. MULLANE has gone to Bonnie Clare, Nevada.
 FRED. M. CARLOCK has removed to Medford, Oregon.
 WALLACE MACGREGOR has gone to Goldfield, Nevada.
 ROBERT LINTON is examining properties in Sinaloa.
 JAMES H. BATCHELDER, JR., is in Socorro, New Mexico.
 F. D. GOODY, of Denver, visited Salt Lake City recently.
 THEO. E. SCHWARZ has gone to Brookline, Massachusetts.
 C. L. CONSTANT, JR., of New York City, has left for Ontario.
 PAUL S. COULDREY is residing in Greenwood, British Columbia.

R. H. FRAZER has left West Point, California, and is now in Berkeley.

W. M. KNOX has returned to San Francisco from Rawhide, Nevada.

WILFRED B. WAINWRIGHT was in San Francisco on his way to Oregon.

WILL WRIGHT will go to Sardinia in October to manage mining properties.

L. D. BISHOP has returned from Denver, Colorado, to Berkeley, California.

SAMUEL DESCHAMPS has returned from Nome, Alaska, to Seattle, Washington.

S. V. TRENT, of the Trent Engineering Co., Salt Lake, has been in the East lately.

HERBERT T. MUZZY has gone from Pittsburg, Pennsylvania, to Los Angeles, California.

W. H. RADFORD has reached New York from a mine examination in the Chocó, Colombia.

F. W. MACLENNAN has returned from Cerro de Pasco, Peru, and is now at Cornwall, Ontario.

THEODORE GROSS, of the London Venture Corporation, has returned to New York from London.

WILLIAM D. O'BRIEN is in San Francisco on a holiday. He will return to Singapore in about three months.

D. C. McDONALD and A. B. COLWELL, of Ely, and FRED. A. EARLS, of Hawthorne, Nevada, were in Salt Lake City last week.

C. COLCOCK JONES reached Seattle September 15 after a two months' trip through the Copper river region of south-west Alaska.

S. S. SMITH, of the staff of the MINING AND SCIENTIFIC PRESS, was married on September 30 to MISS MARY FORGIE, of Berkeley, California.

CURTIS L. KNIGHT, formerly superintendent of the O'Mera mine, near Silver Peak, Nevada, is now with the Ray Consolidated, at Kelvin, Arizona.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, September 30.

| | | | |
|---------------------------|------------|---------------------------|-------------|
| Antimony | 12-12½c | Quicksilver (flask) | 43.50-44.50 |
| Electrolytic Copper | 16¼-16½c | Spelter | 7-7¼c |
| Pig Lead | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

| Date. | Average daily prices in cents per pound. | | | | Silver per oz |
|---------------|--|-------|----------|--|---------------|
| | Electrolytic Copper. | Lead. | Spelter. | | |
| Sept. 24..... | 12.87 | 4.34 | 5.84 | | 51¼ |
| " 25..... | 12.87 | 4.34 | 5.86 | | 51¼ |
| " 26..... | Sunday. No market. | | | | |
| " 27..... | 12.87 | 4.34 | 5.89 | | 51¼ |
| " 28..... | 12.87 | 4.34 | 5.91 | | 51¼ |
| " 29..... | 12.87 | 4.34 | 5.94 | | 51¼ |
| " 30..... | 12.87 | 4.34 | 5.94 | | 51¼ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Sept. 23. | Sept. 30. |
|------------------------|-----------|-----------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 9 6 | 1 11 3 |
| El Oro..... | 1 5 6 | 1 5 0 |
| Esperanza..... | 3 0 0 | 3 1 0 |
| Dolores..... | 1 10 0 | 1 5 0 |
| Oroville Dredging..... | 0 14 0 | 0 14 0 |
| Mexico Mines..... | 6 10 0 | 6 7 6 |
| Tomboy..... | 1 0 7½ | 0 19 0 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St. N. Y.)

MINING QUOTATIONS—NEW YORK.

| | Closing Prices. | |
|--------------------------------------|-----------------|-----------|
| | Sept. 23. | Sept. 30. |
| Amalgamated Copper..... | 82½ | 82½ |
| American Smelting & Refining Co..... | 99½ | 98½ |
| Boston Copper..... | 14½ | — |
| Butte Coalition..... | 25½ | 25¼ |
| Cumberland-Ely..... | 7¼ | 7¼ |
| Dolores..... | — | 7¼ |
| El Rayo..... | — | 1½ |
| Giroux..... | 9½ | 9½ |
| Greene-Cananea..... | 9¼ | 9 |
| Indiana Sonora..... | — | — |
| La Rose..... | — | 9¼ |
| Miami Copper..... | 16 | 16 |
| Nevada Consolidated..... | 28¼ | 24½ |
| Newhouse..... | — | 3 |
| Nipissing..... | 12¼ | 12¼ |
| Ohio Copper..... | 47½ | 47½ |
| Tennessee Copper..... | — | 38½ |
| Utah Copper..... | 49½ | 49 |
| Yukon..... | 5¼ | 5¼ |

(By courtesy of Trippe, Thompson & Co., 25 Broad St. N. Y.)

COPPER SHARES—BOSTON.

| Closing Prices. | | Closing Prices. | |
|--------------------------|------|---------------------------|------|
| September 30. | | September 30. | |
| Adventure..... | 6¼ | Mohawk..... | 61 |
| Allouez..... | 57 | North Butte..... | 61¼ |
| Atlantic..... | 8¼ | Old Dominion..... | 54 |
| Calumet & Arizona..... | 103½ | Osceola..... | 152 |
| Calumet & Hecla..... | 67½ | Parrot..... | 31 |
| Centennial..... | 89½ | Santa Fe..... | 2 |
| Copper Range..... | 80¼ | Shannon..... | 161½ |
| Daly-West..... | 8 | Superior & Pittsburg..... | 16 |
| Franklin..... | 17 | Tamarack..... | 70 |
| Granby..... | 98 | Trinity..... | 121¼ |
| Greene-Cananea, ctf..... | 9½ | Utah Con..... | 43¼ |
| Isle Royale..... | 23¼ | Victoria..... | 34 |
| La Salle..... | 15½ | Winona..... | 7½ |
| Mass..... | 7 | Wolverine..... | — |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, September 30.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 12 | Midway..... | \$ 19 |
| Belmont..... | 80 | Montana Tonopah..... | 1.00 |
| Booth..... | 11 | Nevada Hills..... | 75 |
| Columbia Mtn..... | 10 | Ophir (Comstock)..... | 1.30 |
| Combination Fraction..... | 88 | Pittsburg Silver Peak..... | 65 |
| Daly..... | 11 | Rawhide Coalition..... | 24 |
| Florence..... | 2.87 | Rawhide Queen..... | 25 |
| Goldfield Con..... | 6.85 | Round Mountain..... | 63 |
| Gold Keweenaw..... | 9 | Sandstorm..... | 9 |
| Great Bend..... | 6 | Silver Pick..... | 14 |
| Jim Butler..... | 12 | St. Ives..... | 8 |
| Jumbo Extension..... | 15 | Tonopah Extension..... | 78 |
| MacNamara..... | 30 | Tonopah of Nevada..... | 7.00 |
| Mayflower..... | 13 | West End..... | 30 |

General Mining News.

ARIZONA.

COCHISE COUNTY.

The shaft of the Boston-Courtland Copper Co., at Courtland is down 50 ft. Weldon C. Humphries, the manager, is having the shaft sunk on the drill-hole that the company recently completed.—On the Gardner claim, in the Paradise district, the 285-ft. adit has opened a body of lead ore.—The new adit on the Bisbee-Sonora group is in 125 ft. It is the intention of the owners to drive this adit 1200 ft. to get under the cropings on the surface of the claims.—It is reported that operations will be resumed at the Sullivan property.—The matte output of the Copper Queen smelter, at Douglas, was increased 400,000 lb. in September over the August product, the last month approximating 9,000,000. There were eight furnaces and seven converters running throughout the month.—The drift from the 1250-ft. level of the Oliver shaft at the Calumet & Arizona mine opened a rich body of oxide ore. This is several hundred feet deeper than any other known body of oxide ore in the district near Douglas and from the present showing appears to be one of the richest.

GILA COUNTY.

The north cross-cut from the 500-ft. level of the Telfair shaft of the Arizona-Michigan company is in 95 ft. in a hard diorite. The south cross-cut on the same level has been driven 115 ft., and is expected to open the vein shortly.—The power house at the Arizona Commercial property has been completed and all the machinery installed. A new Prescott pump was installed on the sixth level and both sixth and seventh levels are being opened preparatory to stoping.—The cross-cut from the level 450 ft. below the adit which opened the Black Oxide vein at the Superior & Boston property, intersected the same body of ore. The vein is 20 ft. wide at that point, the ore being copper glance, chalcopryrite and hematite.

GRAHAM COUNTY.

George F. Reed and Dell Potter have made several small shipments of copper ore to the Shannon smelter from the Shannon property in the Upper Metcalf district which they are operating under lease.—At the New York-Arizona a raise is being driven from the lower level to connect with the shaft on the Buzzard Shadow claim for ventilation. John Moulder is superintendent.—A body of high-grade ore was opened on the property of the Arizona Commercial company in Gold gulch near Morenci.

MARICOPA COUNTY.

The Interior Mining & Trust Co. is to resume operations at its property near Wickenburg. The roads which were damaged by the recent rains are being repaired and a site graded for a new double compartment shaft which is to be sunk to the 500-ft. level before lateral work is started. F. X. O'Brien is manager. There is a 100-ton Nissen stamp mill and cyanide plant on the property.

MOHAVE COUNTY.

At the Tucker mine, six miles from Hackberry, there are several tons of shipping ore on the dump, and it is the intention of the management to forward it to one of the smelters shortly.—The cross-cut from the drift at the Gold Crown property, in the Union pass district, opened a 23-ft. vein of ore.

PINAL COUNTY.

The Imperial Copper Co. has a crew of engineers in the field surveying a line from the terminus of its railroad at Silverbell to some deep-water point on the Mexican coast. It is understood that the company is trying to secure the concession for the Arizona & Gulf line, a portion of which survey was run several years ago from Cape Lobos on the Gulf of California to the Mexican-Arizona border.—The Ray Consolidated Copper Co. has let a contract for the building of three miles of railroad from its smelter site to the Phoenix & Eastern line. The company expects the work to be completed before the end of the year.

YAVAPAI COUNTY.

The Dunkirk group of the Mount Tritle Copper Co. was purchased by H. R. Ward, of Grass Valley.—After 17 years of litigation the Crowned King mine, in the Bradshaw mountains, was sold by B. A. Turner, receiver, for the Crowned King Mining Co., to the Yavapai Gold, Silver & Copper Mining Co. for \$75,000, of which half was cash, the balance stock in the company. The property, including 18 claims, is equipped with a 20-stamp mill and is credited with a production of \$1,800,000. The company's plans include the erection of a reduction works at Crown King to treat the ore from the Crowned King, Wildflower and Tiger mines. O. Longacre will direct operations at the mine.—A carload of cobalt and nickel ore is being taken from the Red Bluff group in the Black Hills district for shipment to the refinery in New Jersey to determine the value of the ore. T. C. Jordan is manager for the company.—Operations have been resumed at the Leland group in the Big Bug district. The 500-ft. shaft is being re-timbered and the management has contracted for machinery and supplies. Joseph McDonald is manager.

YUMA COUNTY.

The shaft of the Planet mine, at Planet, is down 400 ft. and will be sunk to the 600 before any cross-cutting is done. At that point the vein will be opened to determine if sulphide ore exists below the water level.—The Bowyer Gold & Copper Co. is to open the Swastika group in the Dome Rock range. Joseph Bowyer, of Quartzite, is manager.—J. C. Rutherford and R. R. McDonald are erecting a small mill on their property near Wenden.

CALIFORNIA.

INYO COUNTY.

(Special Correspondence).—The Keane-Wonder mine, managed by Homer Wilson, is producing about 1500 tons per month of ore that assays \$12 per ton, all of which is treated by the 20-stamp mill and cyanide plant on the property. It is stated that an extraction of 95% is made. The mine is opened by four cross-cuts, and a 200-ft. shaft. The ore occurs in lenses within a well-defined zone. It is conveyed from the mine to the mill over an aerial tramway a mile long. The property is on the west slope of the Funeral range, over-looking Death Valley. The main office is at Rhyolite, Nevada, which is the supply centre.

Rhyolite, September 25.

The Bishop Creek Gold Mining Co. is installing a Sullivan compressor and drill at its property on Bishop creek. The compressor will be driven by a 5-ft. Pelton wheel.

NEVADA COUNTY.

The machinery at the Eagle Bird mine, near Maybert, which was recently injured by fire, is being repaired and the company is preparing to re-build the plant.—The 10-stamp mill at the Pittsburg mine, near Nevada City, has been started on ore from the 900-ft. level.

SAN BERNARDINO COUNTY.

At the Jumbo mine, near Hart, the new management has a shipment of \$50 ore ready to forward to the smelter. This was taken from a shaft that has been started in the cross-cut adit. Another cross-cut has been started 150 ft. north of the one that opened the 30-ft. vein.—Cross-cutting has been started on the 400-ft. level of the Oro Belle property, and the cross-cut on the 100 is expected to cut the ore shortly.—William J. Dingee, of Oakland, has acquired 30 placer claims near Johannesburg which contain large nitre deposits. An assay of the ground showed it to contain from 25 to 28% nitre.

SHASTA COUNTY.

G. P. W. Jensen has leased the 4-stamp mill on the Corte group, near Centerville, to Weed & Wickson who are operating near Igo.—The North Witten adit at the Friday-Lowdon property, near Kennett, recently cut a body of copper ore with a fair gold and silver content. S. E. Bretherton, of San Francisco, is manager.—The Shasta County Farmers' Protective Association has retained T. W. H. Shanahan, an attorney of Redding, to represent it in legal dealings with the smelting companies.—The Inca Treasure Gold Mining Co. has attached the property of the Delta

Consolidated Gold Mines Co., on Dog creek, to secure the payment of \$1233 alleged to be due the former company. —The machinery of the Bella Vista Oil Co. is being hauled to the company's property west of Bella Vista. —The Shasta Gold & Copper Mining Co. has been organized to open holdings between the Pit and McCloud rivers two miles north of Heroult.

SIERRA COUNTY.

The shaft at the Gibraltar mine cut the bedrock at a depth of 300 ft. At that point there was a fair amount of gold in the gravel but the owners have turned along the bedrock to get to the bottom of the channel. —The jig recently installed by Jason Fry on his property in Sailor ravine is making a high-grade concentrate which is being sacked for shipment to the reduction works.

TUOLUMNE COUNTY.

Ione Meinert has purchased the Contention mine with water-right and pipe-line in Knight's creek from Calvin F. Summers. —Work has been resumed at the O'Hara mine at Brown's Flat. —A 6-ft. vein has been opened on the Clark Brothers' ranch adjoining the Hazel Dell mine. —The mill at the Soulsby mine is being repaired and the company will soon be milling the rich ore recently opened. —The shaft at the Dutch mine has been re-timbered for 60 ft. —The Draper property was shut down for a few days pending the turning on of the current by the electric company.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence). —A rich find has just been made on the Lost Treasure property, on Columbian mountain. At a distance of 250 ft. from the entrance of the adit a streak of smelting ore has been cut that is 3 in. wide, and assays from 420 to 800 oz. silver per ton, with 20% lead. William Kramer is owner. —Work has been started at the Centennial mine, on Leavenworth mountain. The pumps have been lowered and drifts will be driven west from both the fifth and sixth levels. D. Kennedy, the manager, returned from the East, and it is expected to start work on the new 50-ton stamp mill sometime during the coming month. —Work on the chemical-electro plant being constructed near the Doric tunnel by the Western Metals Co., is well under way. A concrete wall 196 ft. long has been constructed to a height of 12 ft., and millwrights are now at work in framing timbers and in placing them in position. Grading has been started for the second building, which is to cover an area of 180 by 80 ft. The plant will be finished by the first of the year. —At the E. K. C. property, owned and operated by the Geneva Extension M. M. & T. T. Co., a 14-in. vein of smelting ore was cut in the east drift that assays 300 oz. silver per ton. John O'Dea is manager. —H. O. Marcey, of Boston, who recently purchased the Kelly adit holdings on Democrat mountain, has organized a company to drive it 5000 ft. A series of rich silver veins are owned. These will eventually be intersected by the Kelly bore at depths varying from 1000 to 2200 ft. —A number of mine operators in Clear Creek county have entered into contracts with the Modern Smelter Co. for the furnishing of a certain tonnage of ore. This smelter is located at Utah Junction, a short distance from Denver, and although the furnaces have not been started ore is being purchased, sampled and paid for. The first shipment from Georgetown was made by E. J. Butts, who is operating the Columbia property on Silver mountain. Two carloads have been sampled that were settled for at 2.30 oz. gold and 35 oz. silver per ton, with 5% in copper.

Georgetown, September 27.

GILPIN COUNTY.

A new hoisting plant has been completed at the Rockford mine, in the Russel Gulch district. The shaft is now down nearly 200 ft. and has opened a good grade of milling and smelting ore. Sherman Harris is in charge of operations. —The Evergreen Gold Mines & Copper Co. has let a contract to lay 1500 ft. of pipe from the reservoir to the company's mill. F. J. Crane is superintendent. —Operations have been stopped temporarily at the Argo mine in the lower Russel district on account of the heavy flow of water

due to the recent rains. —A new surface plant is being installed at the Hidden Treasure mine on Quartz hill. —A surface plant has been erected at the Gomer mine on the Pendleton-Gomer Mining Co. and the property is being unwatered. The shaft is now down 150 ft., and it is the intention of the company to sink an additional 150 ft. A. A. Johnson, of Denver, is manager. —The East Notaway shipped a carload of smelting ore to Denver last week.

GUNNISON COUNTY.

The dam at the Blaine mill, which was damaged by the ice last spring, has been repaired and the mill will be in operation some time this month. —Several carloads of ore were shipped by the Empress Mining Co. operating on Galena mountain.

LAKE COUNTY.

Regular shipments are being made from the Pearl mine in the Leadville district. The property is being re-opened by Charles J. Moore, of Denver. —William S. Jones is opening the vein of zinc carbonate ore recently cut in the Robert E. Lee mine and is storing the ore for shipment. —Work has been resumed on the Robert Emmet property and the company is preparing to ship 30 tons of ore per day. —The Horrigan Brothers shipped 50 tons of high-grade ore from the Highland Mary mine.

OURAY COUNTY.

The contact vein recently opened at the Antonio property on Red mountain has been driven upon for 60 ft. Assays across the face ran 100 oz. silver per ton as well as several per cent copper. —The ore from the Frank Hough mine, on Engineer mountain, is being packed to Ouray and shipped from that point on account of the washouts on the line between Animas Forks and Silverton. —A carload of \$60 ore was shipped from the Colorado-Eclipse mine.

PARK COUNTY.

The old sampling works at Alma have been remodeled and are again in operation. There is a crew of men at work grading the site for the new smelter, and it is the plan of the company to have it in operation before the end of the year.

TELLER COUNTY.

The air line from the John A. Logan compressor plant to the Pride of Cripple Creek property has been completed and the machine-drills started in the mine. Fred Johnson is superintendent. —S. N. Simmons has opened a vein of \$25 ore on the 180-ft. level of his lease on the Pharmacist mine on Bull hill. A drift has been run 50 ft. along the ore which has been of uniform grade the entire distance. The lessee will commence shipping at an early date. —Thirty tons of ore was shipped by the lessees from the Jolly Tar mine in Victor. The vein is 3 ft. wide, and is found between a phonolite dike and granite. There is considerable sylvanite in the ore which is estimated to run about \$40 per ton. —The Findley Consolidated company has commenced shipping from its lease on the Deadwood mine on Bull cliffs. —A rich orebody has been opened on the 1400-ft. level of the Golden Cycle mine at Cripple Creek. The ore from the 600 to the 800-ft. levels was low-grade but the value seems to have changed with depth as it did in the Vindicator mine. —Sinking is to be resumed at the Dante mine the early part of this month. The shaft is now down to the 730-ft. level, and the company will deepen this another 200 ft. —Edward Cookerly has discovered a 10-ft. vein of ore that assays \$20 per ton at his sub-lease on the Prince Albert mine. The shoot has been opened to a depth of 15 ft. for 30 feet.

IDAHO.

SHOSHONE COUNTY.

Grading has been started on the site for a 100-ton concentrator at the Orofino mine by the Orofino Mining Co. Some of the ore at this property is rich, running as high as 85% lead. This will be shipped direct to the smelter, the rest being concentrated in the ratio of 6 to 1. A lower adit is also to be started to tap the ore several hundred feet below the present workings. Patrick Burke is manager. —The vein which is being followed at the Reindeer property has widened to 18 in. and assays 20% copper. —

At the Rainbow group, southeast of Osburn, a 2-ft. vein of iron-carbonate, copper and silver was opened.—A 300-ton ore bin is being constructed at the Monarch mine east of Murray and the mill is being increased from 75 to 200 tons per day capacity. Work has been stopped in the raise, there being no place at present to store the ore.—A 20-ton furnace, the invention of Maurice Blanchard and C. D. Williams, of Portland, Oregon, is to be erected between Enaville and Enaville Junction, on the line of survey of the Idaho & Northern railroad. A company, known as the North Fork Mining & Smelting Co., is to be organized to operate the plant and to increase its capacity if it proves successful.—A 6-in. stringer of milling galena ore was opened by a cross-cut 100 ft. from the main vein at the Imperial property between Burke and Mullan.—A 300-ft. drift has been run on the property of the Samson Mining Co., on Eagle creek east of Murray, opening a 14-ft. vein of galena ore. The vein has been stripped on the surface for 200 ft. and it will require 200 ft. additional work in the adit to drive it under this portion of the shoot.

KANSAS.

CHEROKEE COUNTY.

A good find of shallow ore was made at Galena, on the Bonanza tract, at the depth of 28 ft. It extended for some distance and at 32 ft. it was estimated that the ore would run nearly 40%.—Buffalo, New York, parties are sinking a shaft on the De Graff land, at Badger, and have indications of ore at 106 ft. Five drill-holes on this land opened three runs of ore from 105 to 195 feet.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—Among the former properties being brought again into the producing list is the Big Three, west of Joplin. Operations ceased at this large mine some time ago on account of an injunction against it.—Operations have been resumed at the Mercedes, on Center creek. A lower royalty has been granted the company on account of the heavy flow of water.—The Chitwood Bessemer has been taken over by a new company who will reopen it for the pillars. The tailing is being treated in the concentrating plant.—The Old Hickory and Keno mines have been consolidated by J. E. Putman, and are again being operated. A tramway from the Old Hickory will carry the ore to the Keno bins.—The Mercantile Co. is building a new 250-ton mill on a lease north of Webb City.—The Gouverneur Co., on the Excelsior land at Four Corners, has just completed a new 200-ton mill. The company has recently acquired over 1000 acres scattered over the district which they will prospect and sub-lease.—The Tom Cat Co., west of Joplin, has now completed its development having two shafts and several drifts in ore. Work will be stopped until a suitable mill can be erected.—The D. S. & Y. is a new 200-ton plant just completed southwest of Joplin, near the Chicago-Joplin.—Another new plant west of Joplin is the E. J. C. mill near the Kohinoor. A good face of ore has been opened from 100 to 170 ft., running from 10 to 15% zinc. The ground has been well prospected, and a large tonnage of ore stored for treatment at the mill.—Five tailing mills are now working in the Chitwood camp on old tailing piles.—In the Joplin camp a good find of sheet-ore has been made on the Riseling land, the deposit occurring from 123 to 136 ft. The property adjoins the lease held by O. R. Symmes where a rich discovery was made last week.—A good find was made on the O'Keefe land south of Joplin where boulders of almost pure zinc are being taken out, some weighing 400 to 500 lb. There is also a large amount of fine ore mixed with the dirt. At Smelter hill, in sinking the Big Eight shaft, 40 tons of zinc were produced from 56 tons of ore.

Joplin, September 25.

MONTANA.

SILVER BOW COUNTY.

(Special Correspondence).—The death of W. H. Spooner, in Boston, recently, has temporarily delayed the plans for a resumption of work on the Ophir mine by the Butte Central Copper Co. There are two veins in the Ophir, the south one being opened from the 100 to the 500-ft. level. The ore

assays 25 oz. silver and \$2.50 gold per ton, the average in copper so far being around 1%.—Work is to be resumed at the properties of the Butte & New York and Butte-Milwaukee companies. The Butte-Milwaukee is the owner of the Colonel Sellers and Pollock group of claims, and the Butte & New York owns the majority of the stock of the Butte-Milwaukee. The Pollock has been a good silver producer in its time, and there are still large bodies of ore in sight in the mine, which has been worked mostly by lessees. The shaft on the Pollock is a small one and when the Butte & New York people became interested in the Butte-Milwaukee they sank a three-compartment working shaft 750 ft. between two veins which will be opened by cross-cuts when the shaft has reached down 1200 or 1500 ft. The recent discoveries in the Elm Orlu and Blackrock mines have considerably brightened the prospects of the Butte & New York company.—The Davis-Daly company has made temporary repairs at the Colorado, the hoisting engine of which was wrecked two weeks ago, and is operating again. The shaft is now considerably below the 1500-ft. point, and is still being sunk. At the same time development and mining is going on on the 1200 and 1400-ft. levels, the ore shipment being an average of 100 tons per day.—James A. Murray, owner of the fractional Ticon claim, situated in the North Butte group of claims, makes the announcement that he will not bring an action against the North Butte company over the apex of the Edith May vein, and that he has contemplated no such action. This being contrary to statements by his engineers and other statements made by Mr. Murray himself, indicates that a settlement has been made or he has been convinced that his claim of ownership of the Edith May apex is without foundation. The impression in Butte is that the North Butte will soon be announced the owner of the Ticon. The suit brought by the Ticon lessees in behalf of Murray, and with his backing, against the Anaconda company, is still pending in court.

Butte, September 24.

NEVADA.

ESMERALDA COUNTY.

The vein of the Victor claim of the C.O.D. Consolidated Co., has been opened by the cross-cut 90 ft. from the shaft. A dacite intrusion has changed the dip of the vein from vertical to approximately 25 degrees. I. K. Koontz is manager.—The Red Top Mining & Leasing Co. has completed the installation of a new surface plant to replace the one recently destroyed by fire and has resumed development. The raise from the 425-ft. level cut a quartz vein with a considerable copper content.—At the Goldfield Montgomery, six miles east of Goldfield, a 10-ft. vein with 2 in. of high-grade ore has been opened.

LINCOLN COUNTY.

A consolidation of the Nevada Utah and Ohio Kentucky mines at Ploche has been effected and operations have been resumed at both properties.

NYE COUNTY.

(Special Correspondence).—The Johnnie Mining & Milling Co., operating the Johnnie mine, 15 miles south of Amargosa station, is milling 80 to 100 tons of ore per day, the mill having 16 Nissen stamps, amalgamating plates, and a Chilian mill for re-grinding the battery-pulp, all operated by two Fairbanks, Morse & Co. gasoline engines. The operations are now under the superintendency of William A. Farish, Jr., of El Paso, and there are 45 men on the payroll.—Overbury & McMahon have a long-term lease on part of the Tramp Consolidated ground at Rhyolite, through which they will operate on the Eclipse and Hobo veins. A cross-cut has been driven to the Eclipse, and 1000 ft. of drifts run on the vein, opening a good tonnage of ore. A contract has been let for further development. The ore consists of a gold-bearing silicified rhyolite, which is of fair milling grade. A. Sydney Addison, of San Francisco, who is general manager for the lessees, is on the ground testing the ore, and drawing plans for a 10-stamp mill and cyanide plant, which will be erected this fall.—The Montgomery-Shoshone mine and mill, at Rhyolite, are doing well under the management of John G. Kirchen. Financial obligations

of the concern to the amount of \$275,000 have been paid within the last 14 months. The ore, a rhyolite-quartz, runs from \$7 to \$8.50 per ton gold, with 10 oz. silver to \$20 gold. The mill, which is in charge of E. M. Kirchen, is crushing and treating 6000 tons per month. The ore is passed through Blake crushers, followed by sizing and re-crushing through three sets of rolls, and re-grinding in two Monadnock Chilian mills, in cyanide solution. The pulp is then passed to Dorr classifiers, the sand being sent over Wilfey-tables and the slime to vanners. The resulting concentrate is then re-ground in an Allis-Chalmers tube-mill, in cyanide solution, and further cyanided in cone-tanks. The table-tailing is carried to the sand leaching tanks, the vanner tailing to the slime leaching tanks, the latter being provided with L. C. Trent agitators. The gold-bearing solution from the slime tanks is passed through Butters and Blaisdel filters before going to the precipitating tanks. At the mine the work is in charge of George Liles, and ore is being taken from six levels.—The Bullfrog & Mayflower Consolidated Mining Co., in Pioneer district, contemplates adding 15 stamps to its present 5-stamp mill. The mine is opened to a depth of 400 ft., and several lessees are at work. On the Aylward lease, a 300-ft. shaft is being sunk, and no lateral work will be done till that depth is reached.—E. P. Miner, of Rhyolite, has found sulphide ore in a 40-ft. shaft in Indian Springs district, half way between Rhyolite and Pioneer.

Rhyolite, September 25.

WHITE PINE COUNTY.

The Mulligan group of claims of the Boston-Nevada Mining Co., situated 2½ miles from Osceola, is being developed under direction of F. D. Goody, of Denver, who states that the development is by adit levels, and that a discovery of gold and silver ore was made recently.

OREGON.

BAKER COUNTY.

The Keystone Dredging Co. has completed payments on 440 acres of placer ground below Sumpter. The company has obtained options on several tracts of land and will do considerable prospecting to determine the value of the properties for dredging.—An order for 25,000 ft. of lumber has been placed with the Adams-Gardiner Lumber Co. to build a boat for the dredge at Gold Center. The machinery was previously mounted on trucks but these became clogged with the tailing and the company decided to construct a boat. J. B. Wetherall is in charge of the work.—The National Mining & Leasing Co. is installing a tube-mill and slime-filter in its plant at the Cougar mine. The capacity of the mill is 80 tons per day. There is a large amount of ore blocked out in the mine that assays between \$10 and \$20 per ton.—The Highland mine is shipping regularly to the sampling works.—The drift on the 200-ft. level of the Independence mine west of Sumpter opened a shoot of ore that assays from \$34 to \$220 per ton. Walter G. Gleson is manager.

JACKSON COUNTY.

There are 10 men working at the Braden mine which J. W. Dawson is operating under a lease.—At the Lucky Bart mine, in the Sardine Creek district, the owners are blocking out ore and repairing the wagon road.—The new machinery recently ordered for the Gray Eagle mine is expected to arrive any time.—The owners of the Blackhawk mine, at Drummond, are to commence operations shortly.—A 5-stamp mill will be erected at the Trustbuster mine, of W. R. Oxley, in the Sams Valley district within the next two months.

MARION COUNTY.

The vein recently cut at the Black Eagle mine, in the Santiam district, is proving very rich, assays having been obtained running as high as \$400 per ton.

PENNSYLVANIA.

SOMERSET COUNTY.

A unique discovery of vanadium in appreciable quantity was made recently in one of the coal deposits near Rockwood. Details of the new discovery are closely guarded.

UTAH.

BEAVER COUNTY.

J. C. Brownfield has purchased the Pay Day group of claims in the Beaver Lake district from Mell Smith and operations will be resumed at the property within the next two months. There is a 130-ft. shaft and a 100-ft. drift on the ore, which assays from \$80 to \$100 per ton.—A diamond-drill has been installed at the Blackbird mine. J. R. Steele is in charge of the work.

JUAB COUNTY.

The cross-cut to the southwest on the 300-ft. level of the Bullion-Beck mine of the United States Smelting, Refining & Mining Co. opened a body of copper ore of smelting grade.—The shaft of the Tintic Standard is now down 450 ft. The company will sink to the 600-ft. level and cross-cut from that point.—The Iron Blossom, Colorado, and Sioux Consolidated declared dividends of 8c. per share for the two former and 7c. for the latter.—Work has been started on the drainage adit at the Centennial-Eureka from the surface and the 500-ft. level of the shaft. The adit will be 3000 ft. long and save a lift of 500 ft. on the hoisting and pumping. The company is to install a heavier pumping plant owing to the heavy flow of water met in the shaft some time ago.—The shaft at the East Tintic Development Co.'s property, in East Tintic, is down nearly 500 ft. When the shaft reaches that level a station will be cut and laterals started to explore the ore. Six cars of ore have been shipped from the mine lately which have netted the company a profit over all mining and shipping expenses. Ralph Kellogg is manager.—At the Grutli property, in East Tintic, the shaft is down over 190 ft., and has cut the contact on which the orebodies are found. A station will be cut at the 200-ft. level and drifts run along the contact. The company is planning the erection of a power plant and the installation of machine-drills.—The injunction which restrained the Grand Central from operating on the 1600-ft. level has been dissolved and the company is cross-cutting there, to open the orebody found on the lower levels. On the 2000 and 2100-ft. levels a 6-ft. body is being opened that assays 7% copper, 10 oz. silver and \$9 gold per ton.

SUMMIT COUNTY.

The completion of the Ontario drainage adit at Park City has done much to relieve the water trouble at the American Flag property and the shaft has been drained to the 1100-ft. level. There is a large amount of milling ore blocked out in the mine and it is understood that the company is considering the erection of a mill. G. H. Rathman is manager.—A drift has been run 130 ft. on an 18-in. vein at the Silver King mine, the ore from which assays well in copper, lead and silver, with a small amount of gold. The management has ordered a skip and will install it in the shaft in place of the bucket it has been using.—Preliminary work has been started on the Snake Creek-Bonanza Flat-Daly-Judge adit by commencing the surface plant on Snake creek. The completion of this adit will open a large territory of mineral land in the Park City district, and insure good drainage to the mines along its course.

The Iowa Copper company at Park City has started shipping copper ore to the smelter.—The raise from the adit of the Baby McKee mine has opened a 2½-ft. body of ore that assays 8% lead and 75 oz. silver per ton.—On the 260-ft. level of the Uintah Treasure Hill mine a cross-cut is being driven toward the vein.

TOOELE COUNTY.

At the new smelter of the International Smelting & Refining Co., in Pine canyon, 12 of the 32 McDougall roasting-furnaces are complete. The brick flue has been started and the foundation for the stack finished. When completed this will be 320 ft. high. A number of pack trains are busy transporting material from Pine canyon for the aerial tram between the property of the Utah Consolidated and the smelter.—At the Silver Island mine the company is sacking ore for shipment that is worth about \$5 per sack. David Morrison is in charge of the work.

UTAH COUNTY.

A new body of lead carbonate ore has been opened at the

Mountain Dell property, near American Fork. The ore is being sacked for shipment at the mine.—At the Pacific property an orebody has been opened that assays 24% zinc, 15 oz. silver and a small amount of lead.—Operations have been resumed at the property of the Lulu Mining Co., on Deer creek. A 300-ft. drift has been driven along the vein opening a good vein of copper ore.—A contract to drive the adit 150 ft. has been let by the management of the Signet Mining Co. operating at Holman's flat.—The face of the adit at the Mineral Flat property is in a hard black limestone which overlies the ore-bearing porphyry. A 3-ft. vein of high-grade galena ore was recently opened in the mine and it is understood that the company is to commence shipping in the near future. Swan Nelson is superintendent.

CANADA.

BRITISH COLUMBIA.

The company operating the Blue Bird mine, near Ross-

assaying 2800 oz. silver.—Surface trenching on the Mann property at Gowganda opened a calcite vein in which there is from 2 to 4 in. native silver.—A cross-cut on the 120-ft. level on the Nova Scotia mine is being driven to tap the main Bilsky vein. A shaft has been sunk on this ore and at the bottom the vein contains from 3 to 4 in. of smaltite with native silver. The vein has been traced on the surface for 500 ft., and enough ore blocked out to keep the mill crushing at the rate of 75 tons per day for the next four years. R. S. Robertson, of the Peterson Lake Mining Co., has brought suit against the Nova Scotia company to recover \$1,000,000 damages for ore extracted by the latter company from the former's ground and to restrain the Nova Scotia from trespassing on the Peterson Lake property.—At the Temiskaming the crusher-house is nearly completed and the machinery is being installed. The ore will be dumped from the skips to the bins there, and be reduced before it is loaded on the aerial tram for the concentrator. In the mine the company is to sink to the 350-ft. level. The



Steam-Shovel Mining, Utah Copper Mine.

land, is preparing to open the mine on a larger scale. Ore taken from the surface workings of five veins netted the company \$30 per ton on a 10-car shipment.—The British Columbia Copper Co. has bonded three additional claims in the Kamloops district, the Irene, Sunset, and Shamrock. The veins on these claims will approximate \$20 per ton.

There are 80 men working in the Le Roi mine, and a good grade of ore is being stoped on the 600 and 700-ft. levels. The company is also carrying on considerable exploratory work with diamond-drills.—A Minneapolis company has purchased the Blair and Voigt coal claims in the Nicola valley

ONTARIO.

The new cyanide plant at the Buffalo mine in the Cobalt has been completed and is successfully treating the ore from the mine. The ore is ground fine, classified, and cyanided, the slime going to a filter press. The plant has a capacity of 50 tons per day.—S. W. Cohen, manager of the Crown Reserve mine, has been appointed consulting engineer, and John Carson, president of the Crown Reserve, has been elected president of the Silver Leaf company. This tends to confirm the report that the Crown Reserve has bought the controlling interest in the Silver Leaf property.—The Wettlaufer mine in South Lorrain shipped 25 tons of ore

shaft is now down 336 ft. with cross-cuts run at the 300-ft. point.

MEXICO.

CHIHUAHUA.

The Refugio mine, in the Parral district, is being unwatered. Thos. Sheppard, representing A. J. McQuatters, is in charge of the work, and has a force of men cleaning out and re-timbering the shaft. There is a 150-ton mill on the property, erected by Angel Garcia, the former owner. A crew of men is also at work repairing the spur from the Parral & Durango railroad to the mine.—The San Francisco del Oro Mines Co. shipped 500 tons of ore to Wales to determine the best method of treatment. There is a large amount of rebellious ore blocked out in the mine.—The Parral Consolidated Mines Co. has completed the foundations for its new mill on Prieta hill, and is erecting the framework. Several carloads of machinery are on the ground, and the company expects to complete the plant this fall.

COAHUILA.

The Sabinas Coal Co. has placed an order for 60 coke ovens to be installed in its plant at Rosita at an estimated cost of \$300,000.

Special Correspondence.

GOLDFIELD, NEVADA.

American Mining Congress. — San Francisco Delegation. — Mineral Palace. — Cave of Hampton Stope. — Splendid Rescue-Work. — Clermont Shaft. — Combination Fraction. — Daisy. — Diamondfield Black Butte Re-Organization

The twelfth annual session of the American Mining Congress opened in Goldfield on Monday, September 27, under most auspicious circumstances, and with a representative attendance of delegates from all parts of the United States. The San Francisco delegation, over 100 strong, and accompanied by a brass band, arrived in three special cars and did much to enliven the meetings of the congress and to strengthen the good feeling between the people of southern Nevada and the metropolis of the Pacific coast. Among the delegates and visitors from San Francisco who registered at the Mining Congress headquarters on the opening day were: Nat Boas, T. Gottfried, A. B. Ruggles, Herman Zadig, Francis Drake, K. C. Simpson, W. A. Gamont, C. T. Hutchinson, Leon W. Hall, E. O. Shreve, H. H. Haxon, R. M. Mein, Louis Rosenfeld, A. L. Langerman, Henry G. Meyer, William Sexton, E. P. Jones, E. B. Braden, R. L. Dunn, G. B. Lane, T. Rickard, H. F. Gerry, C. W. Wilson, N. Whitehead, W. A. Scott, W. B. Hinchman, J. H. Berghäuser, L. H. Van Wyck, William O'Connor, R. F. Coffin, J. C. Fitzsimmons, J. R. Ferguson, B. F. Shaw, E. Green, P. C. Jurs, G. W. Myers, W. R. Berry, William Bannon, William C. Ralston, E. H. Benjamin, and H. Foster Bain.

While the disastrous cave-in of the Hampton stope in the Combination mine prevented the delegates from seeing that famous portion of the workings, arrangements had been made by George Wingfield and J. H. Mackenzie to show them the Mohawk, and automobiles were placed at their service. A heavy rain during the greater part of the first day kept most of the delegates within doors, but they were afforded every opportunity of inspecting the mines and mills of the district. The town was gaily decorated with flags and bunting, and various forms of entertainment provided for both night and day, closing with rock-drilling contests for large prizes and a street carnival called a 'Malapai Mix-up.'

The first session of the congress was called to order at 2 p. m. Monday, in the Hippodrome by Joseph H. Hutchinson, chairman of the local executive committee, and formerly lieutenant governor of Idaho. Many of the delegates did not arrive until later. The San Francisco train was delayed several hours by a washout, necessitating some changes in the program. Governor D. S. Dickerson, who was scheduled to make one of the addresses of welcome on behalf of the State of Nevada, telegraphed that he was confined to his home by illness, but hoped to arrive before the close of the session. After making a speech in which he paid a high compliment to the San Francisco delegates, Chairman Hutchinson introduced Charles S. Sprague, president of the Goldfield Chamber of Commerce, who welcomed the visitors and who was followed by State Senator George D. Pyne.

J. H. Richards president of the American Mining Congress responded with an impressive address and paid a high tribute to the mining men of southern Nevada and the spirit which had conquered the desert and its hardships, and had built up a great and rich mining community. Edward H. Benjamin, of the Joshua Hendy Iron works, formerly prominent in the California State Mining Association, responded for his State and was succeeded by George W. Hall, mayor of Jerome, Ariz., J. A. Holmes, chief of the technologic branch of the United States Geological Survey at Washington, and E. R. Buckley of Missouri, one of the directors of the congress.

The most interesting feature to many, of the day's program was the formal opening of the mineral palace in which a collection of specimens has been assembled which, according to experts, has not been paralleled in any

state. The exhibit occupies the entire ground floor of one of the largest buildings in Goldfield, and is of great interest from the fact that every mining camp in the state is represented, and not only rich ore is shown but characteristic specimens of low-grade ore and country rock. The last legislature made a generous appropriation to provide for the collection of this exhibit, the greater portion of which will be donated to the Mackay School of Mines in connection with the University of Nevada upon the conclusion of the sessions of the Mining Congress.

The exhibit contains several hundred tons of ore and minerals, and shows in detail the character of the product of every mining camp in Nevada. A feature which is particularly attractive is a long white cabinet, faced with glass, and brilliantly lighted by electricity, which contains the richer specimens. During the last two days of the Congress this cabinet will contain the entire output for a week of both the Consolidated and Florence mills, and it is already an almost dazzling exhibition of gold, silver, and other metals and rare specimens. There are several private collections in the mineral palace, including the Helen M. Schneider collection which has taken numerous prizes at national exhibitions, and was shown throughout Europe. Other collections include that of the State School of Mines, the Loftus-Davis cabinet of Round Mountain and other specimens, and those of W. S. Elliott and Charles F. Kapp.

The disastrous cave-in of the Hampton stope on the morning of Saturday last, in which the lives of three miners were lost, has occupied the attention of mining men in the district to the exclusion of almost every other subject. Aside from the tragedy the loss by the caving of the workings will, it is said, be comparatively slight, although it will result in curtailing the Consolidated company's profits nearly \$60,000 monthly until the new mill is enlarged. It has been the intention of the management to dismantle the Combination mill, as the cost of ore-treatment in this plant has been considerably higher than in the new mill, and it stands over valuable orebodies which will be stoped to the surface. Nine of the large cyanide tanks, filled with 1% solution of cyanide and pulp, were precipitated into the great hole made by the cave, and the lower portion of the plant was completely wrecked. The entire building and equipment will at once be removed. It is probable that steps will be taken shortly to increase the capacity of the new mill on Columbia Mountain to 1000 tons daily.

The management of the Consolidated company is completely at a loss to account for the caving of the Hampton stope. Mr. Mackenzie had gone to the mine at an early hour, and was on the ground when the cave occurred. Mr. Canavan, the superintendent, had reported to Mr. Mackenzie that one of the shift-bosses had told him that the ground at the fifth level had the appearance of caving, and the superintendent immediately ordered all the men in the lower workings to collect their tools and leave the mine. The cave came while some were on their way to the surface, and two or three were struck by flying rocks or thrown against the walls by the concussion of air but none was badly injured. The first cave started above the fifth level and came with great suddenness. Mr. Mackenzie and Mr. Canavan at once descended to the fifth level to make an inspection, and while they were underground the second cave happened, taking the ground above completely to the surface, and leaving a gigantic hole into which a portion of the mill was hurled. Upon reaching the surface, Mr. Mackenzie learned that three miners working at a depth of 130 ft. in a new-cross-cut had not reached the shaft, and at once rescue parties were started to work from two points, the nearest being 35 ft. distant, necessitating a drift through solid and exceedingly hard rock. The distance was accomplished, working two machine drills side by side, and with an army of men working four-hour shifts, in less than 36 hours. Little hope was entertained from the first that any of the entombed men would be rescued alive, as it was apparent that the air-pipes must have been broken, but air was pumped into the pipes continuously, and the miners worked like demons, often refusing

to quit at the expiration of a shift. No cars were used, the muck being passed by shovel from one man to another, making a continuous line, and shooting was done every two hours. Men became sick from the powder smoke and were taken out and replaced by others, but there was not an instant's delay to let the smoke clear away, and every shot broke down at least 2 ft. of rock. When the cross-cut was finally reached, the body of Evan Reese, one of the miners, was found leaning against the sloping face of broken rock with his arms folded. The cave had left a space only about 10 ft. long, and in this he probably died from suffocation within 15 minutes. The other men, W. J. Bertsch and M. C. Matt, evidently tried to escape after hearing the first cave, and were caught beneath the falling upper ground, and were buried under thousands of tons of rocks. The search for their bodies is going forward night and day, but it may be weeks before they are found.

The Combination shaft and the northern portion of the Hampton stope are not affected by the cave, and the mine will now be opened from the fourth and fifth levels where it will be possible to extract a large tonnage of good ore more economically than before the ground fell. This territory will be opened by a system of 'glory-holing' to the surface, and nearly all of the caved material is of sufficient value to be put through the mill. Operations in the Combination mine will not be materially affected in any way by the mishap, but the company's production will be reduced for the time being by the amount treated heretofore by the Combination mill. There will be no curtailment of the tonnage handled by the 100-stamp mill as this can readily be taken from the Mohawk and Red Top mines.

Development from the Clermont shaft continues to produce the most gratifying results, and it is said on the highest authority that one of the best orebodies exposed on Consolidated territory is that which has been opened at the 860-ft. level where there is much high-grade ore in sight, and the ore-shoot is of large proportions. George Wingfield is here, having come from his home in Reno to attend the Mining Congress, but the caving of the Hampton stope has prevented his taking any active part in the work of the Congress. He has been at the mine with Mr. Mackenzie a large part of the time. The 600-ft. north drift from the Clermont has cut the hanging wall of the Red Top vein on the Lucky Boy claim, but the extent of the orebody at this point is still undetermined. At the 730-ft. level the ore has been followed for over 200 ft., and is from 12 to 25 ft. wide. The orebody lately opened in drifting from the 600-ft. level of the Mohawk is one of the richest exposed in the mine, and is in practically undeveloped territory with virgin ground all the way to the surface.

Reports from the Combination Fraction indicate that the orebody exposed a fortnight ago, and which has been opened at the 300 and 425 levels is maintaining its early promise, both in point of quality and volume. The seams of high-grade ore in which free gold is visible in abundance, and which appeared at first in the center of the vein, are now being found on the footwall as well, and it is said that the early averages of from \$120 to \$160 per ton across the entire breast of from 8 to 10 ft. are being maintained as the ore-shoot is further opened, and that the high quality of the ore has proved unexpectedly uniform. The output from the Fraction is about 80 tons daily, and the ore is graded for treatment to over \$40 per ton. The Fraction has a large tonnage of milling ore exposed at various levels, chiefly between the 250 and 450-ft. Another new vein of milling ore will add materially to the ore-reserves.

The Daisy mine is shipping two grades of ore, the first-class assaying from \$130 to \$160 per ton, and the second-class from \$25 to \$35. The mine has produced approximately \$250,000, and since the management has been in the hands of C. D. Wilkinson, now president of the company, barely one-tenth of the work has been devoted to production, the principal efforts having been confined to development. The mine has over two miles of underground workings and 50 men are employed on the ground. The deepest

shaft, 500 ft., is now being worked by two sets of lessees, and ore is being taken from the 200-ft. level and shipped to the sampler. The veins of the Daisy are of large size, averaging from 15 to 20 ft. wide, and the grade of ore is more or less irregular, though ore of excellent quality is found over a wide area. The equipment includes two electric hoists of 50 and 30 hp., a 100-hp. compressor, and an electric triplex pump which is installed at the 400-ft. level. Much of the Daisy ore is 'base,' and does not respond to treatment by the milling processes employed locally. With the completion of the Goldfield-Ely railroad, affording a short haul to the smelters of the latter camp, the Daisy will be enabled to market a large tonnage of ore which cannot be handled profitably under present conditions.

Three leases on the Daisy are in pay-ore. There are prospects that the financial difficulties involving the Diamondfield Black Butte Con. will be cleared up, and the company placed in a position to resume development. A plan of re-organization has been suggested by L. L. Patrick, president of the First National Bank of Goldfield and Frank M. Ish, president of the Black Butte, to whom the company is indebted in a sum approaching \$17,000. It is suggested that the property be sold to satisfy a judgment for the amount of the indebtedness, and that the two principal creditors accept the company's note for the amount, placing the note in the hands of a trustee or trust company by whom the re-organization shall be affected. Then it is planned to permit the exchange of the present stock for shares in the new corporation, share for share, upon the additional payment of 2 cents per share or, if the stock of the new company be made assessable, by the payment of $\frac{1}{2}$ cent per share. In the present company, which is capitalized for 2,000,000 shares, Mr. Patrick holds 120,000 shares, and Mr. Ish 300,000 shares. The smaller debts of the company have been paid during the past four months from royalties received from lessees and there is a small cash balance on hand, but not enough to begin mining operations. The mine, in which there are over 15,000 ft. of workings, has exposed large quantities of good milling ore, but a reduction plant will be required to make a profit from most of it.

Two deep shafts are being sunk on the Polverde claim, the joint property of the Consolidated and Jumbo Extension companies. Both shafts are to be sunk 1000 ft., and both will penetrate the Clermont vein in depth. All royalties from these operations will be divided equally between the two owning companies. The Grizzly Bear shaft on the Jumbo is close to the 800-ft. level, near which point it is expected to cut the Mohawk vein. Sinking will be resumed shortly from the 600-ft. level of the Nevada Gold Ore Mines Co.'s lease on the Gold Bar claim of the C.O.D. Consolidated, and the 500-ft. cross-cut from the latter company's Victor shaft has penetrated the vein, and a winze has been started in the ore. Thomas A. Lister is sinking on the C.O.D. claim at a point where high-grade ore has been found at the surface. The Pittsburgh Nevada Co., which recently acquired the Rialto group, giving it 91 acres about three miles east of the town, has cut through 35 ft. of vein at the 400-ft. level, the last 16 ft. being hard quartz, and the formation almost identical in character with that of the veins in the producing portion of the district. An 8-ft. vein was cut in the Rialto shaft yielding assays up to \$154 per ton. This shaft will be continued to a depth of 500 ft. Pay-ore is exposed at a depth of 600 ft. in the Stoneham-Moore-Griffiths lease on the Combination No. 2, near the bonanza Reilly lease, but a heavy flow of water has impeded progress of late. On the Red Hill but one lease is operating, that of the Mining & Ore Reduction Co., and this shaft will be sunk deeper. One drift on this ground has been driven 1800 ft. Local operators are working the Kendall shaft under lease, their territory embracing a portion of the Sandstorm. It is reliably reported that the orebody on the Goldfield Belmont is developing into one of great size, with assurance of a heavy production.

Railroad traffic has been so obstructed by washouts in every direction that the work of organizing the Mining Congress for effective discussion was considerably delayed.

GARDINER, MONTANA.

American Institute of Mining Engineers.—Tour of Yellowstone Park. —Transportation Difficulties.

The eastern members of the American Institute of Mining Engineers and their leaders who are journeying westward for the purpose of attending the sessions at Spokane, arrived at Mammoth Hot Springs, Yellowstone National Park, Saturday morning, September 18, a trip through the Park being one of the attractions incident to the meeting. From Chicago the party has been traveling in a special Pullman train, the cars being left at Gardiner, the gateway to the Park, where they will be held until this part of the trip is completed. The arrangements for the special train service had been made by Theodore Dwight, under whose charge similar parties of the Institute membership had been conducted on the trips to California, Mexico, Nova Scotia, British Columbia, and Alaska. Unfortunately Mr. Dwight's business engagements prevented him at the last moment from accompanying the party, but his place has been well filled by A. E. Vaughn who has been associated with Mr. Dwight on former trips, and who also managed the trip to Chattanooga last October. The service rendered by the Chicago, Milwaukee & St. Paul and the Northern Pacific railways in handling the train has been all that can be desired, the rather fast schedule arranged for having been exceeded in the accomplishment. This acted somewhat to the discomfort of one member who expected to join the party at St. Paul, and found that it had left an hour ahead of time. By a good sprint he caught up with the rest of the party at Mammoth Hot Springs Saturday morning. Saturday afternoon was spent in doing the usual tourist 'stunt' of going over the formation and enjoying the natural wonders of the Mammoth Hot Springs. Nearly everywhere one goes in the Yellowstone Park it is the formation that holds the attention.

On Sunday morning, almost in the cold gray dawn, well bundled up in sweaters and overcoats, the forty mile ride to Fountain Geyser and hotel was begun. Stop for lunch was made at Norris basin, and an hour or so was pleasantly occupied in going over the formation and receiving instructions from the guide in regard to the chemical and physical theories of geyser activity. More of formation was absorbed at the mammoth paint pots and the Taft geyser at Fountain, the geyser obligingly coming into play just at the brilliant sunset of what had been a cloudy gray day. In the evening after dinner, services were held in the large public hall of the hotel, Dr. Raymond addressing the company on the life and character of the apostle Paul.

Going through the Park is a strenuous occupation. Calls are made at 6 or 6.30 in the morning and no longer time than necessary is given for dressing and for breakfast, for the stages are at the door at 7.30 or 8 o'clock, and the starts are made promptly. There are consequently few temptations for late hours at night, and 10 o'clock sees the halls pretty well deserted. Monday morning was occupied in driving to Upper Basin where the star performer of the Park, Old Faithful, holds sway. Short stops at various formations along the route relieve the trip, but the performances of Old Faithful himself are the main attractions. The Institute party arrived at Old Faithful Inn at about 10.30 and although the day turned out to be one of wind and rain and snow, most of the travelers braved the elements and did the 'formation route' in regulation tourist fashion. "Day before yesterday" is, however, the proper time to visit this particular section of the Park, for then it is that the Grand, the Economy, and other spouters less regular than Old Faithful, have done their turns. Such at least was the experience of the Institute party. The illumination of Old Faithful by searchlight at night makes up for what one misses in other respects, however, and this effect at night, heightens the beauty of the eruption and is in itself worth the whole trip.

An early start was made on Tuesday morning for the ride across the mountains to Yellowstone lake, but the pleasure and comfort of the trip were marred by the cold weather and the snowshowers, and it was a chilled party

that arrived at the Lake Hotel that evening. A ride of eleven miles on Wednesday morning brought the party to the crowning glory of the Yellowstone, the falls and the Grand Canyon, and the afternoon was spent in the enjoyment of these wonders. The tour of the Park is well arranged to make these the last portion of the sight seeing, for it is bound to give even the most unappreciative visitor the feeling that he has had the worth of his money and has been repaid for the fatigues of his journey.

The opinion generally expressed was that in this day of electrical means of transportation, better methods for conveying tourists through the Park should be instituted. The old-fashioned stage is fatiguing and the travelers are rushed through the places of interest in a manner that detracts materially from the pleasure of a visit to this great public Park, dedicated to the "instruction and enjoyment of the people" but seemingly operated for the benefit of the Yellowstone Park Association. The roster of the Institute party as it toured the Park was as follows:

W. S. Ayres, Mrs. W. S. Ayres, Hazleton, Pa.; A. R. Bellinger, Syracuse, N. Y.; F. H. Bostwick, Mrs. W. H. Bostwick, Denver; D. Owen Brooke, Mrs. D. Owen Brooke, Birdsboro, Pa.; Dr. D. W. Brunton, Denver; Charles Catlett, Stanton, Va.; H. S. Chamberlain, Mrs. H. S. Chamberlain, Chattanooga, Tenn.; J. W. Dougherty, Steelton, Pa.; Miss J. L. Douglass, Brooklyn; Miss Anna Fries, Philadelphia, Pa.; Miss H. Gage, Denver, Colo.; Miss J. A. Glendinning, New York City; T. B. Greenfield, London, Eng.; Arthur Harrington, Miss Helen Harrington, M. H. Harrington, Mrs. M. H. Harrington, Philadelphia; E. S. Hutchinson, Mrs. E. S. Hutchinson, Newtown, Pa.; T. D. Jones, Scranton, Pa.; Reiji Kanda, Tokyo, Japan; Wm. Kelly, Mrs. Wm. Kelly, Vulcan, Mich.; Wm. Kent, Mrs. Wm. Kent, Sandusky, Ohio; A. H. Lawton, New York; John Lilly, Mrs. John Lilly, Wm. Lilly, Landisville, N. J.; Chas. McCrery, Birmingham, Ala.; W. S. Mitchell, Mrs. W. S. Mitchell, Haileybury; J. W. Nesmith, Mrs. J. W. Nesmith, Mrs. F. L. MacFarland, Denver; E. W. Parker, Washington, D. C.; J. G. Perry, Mrs. J. G. Perry, Denver, Colo.; Miss M. B. Pilling, Ross Pilling, W. S. Pilling, Mrs. W. S. Pilling, Philadelphia, Pa.; H. H. Pinkey, Thurmond, W. Va.; S. H. Pitkin, Cleveland, Ohio; Dr. R. W. Raymond, Miss Emily Saunders, Miss Jean Saunders, Miss Lopise Saunders, Mrs. W. B. Saunders, W. L. Saunders, W. L. Saunders Jr., New York; A. T. Shurick, Washoe, Mont.; Mrs. T. B. Smith, Norristown, Pa.; Dr. W. O. Snelling, Pittsburg, Pa.; Geo. Steiger, Washington, D. C.; Dr. Jos. Struthers, New York; A. E. Vaughan, Mrs. A. E. Vaughan, Brooklyn, N. Y.; S. T. Wellman, Cleveland, Ohio; C. R. Weiss, Philadelphia.

NEW YORK.

Nipissing Mines. — Dolores Dividends. — Camp Bird & Pachuca. — 'Porphyry' Coppers.—Guanajuato Consolidated.

At a meeting of the directors of the Nipissing Mines Co., held in New York this week, the regular quarterly dividend was increased from 3 to 5%. An extra dividend of 2½% was also declared. Up to the present time, Nipissing has been paying 3% per quarter regularly, and 2% extra. The Nipissing company reports \$8,000,000 as the value of the ore now blocked out. Veins 64, the Fourth of July, and the Meyer, are reported as showing \$3,000,000 in ore reserves, the Kendall and connecting veins, \$3,000,000, vein No. 122, which has been developed since June, \$1,000,000. The company has \$750,000 cash in the treasury, and \$500,000 worth of ore with the smelters. Upon the announcement of the increase in the dividend-rate, the stock sold up to \$13.50 per share, from which it has reacted about a point. The directors of the La Rose Cons. Mines Co. held a meeting at the same time. The La Rose dividend was not increased. The New York office of the Dolores Mines Co. reports a satisfactory condition at the mines at the present time. The condition, both as to ore reserves and earnings, is such that the directors have felt warranted in increasing the regular dividend from 12 to 18% yearly. It is reported that the next dividend will be on the basis of 24% annually. While on the subject of recent dividend declarations, it may be said that a prominent Camp Bird 'insider' states that Camp

Bird, Ltd., will at the next meeting of the board of directors, increase the regular dividend from 20 to 40% yearly. The same person states that the Camp Bird-Santa Gertrúdis deal will be closed within the next 30 days. A substantial deposit has already been made at the City of Mexico to bind the bargain, and it is regarded here as definitely settled that the ownership of this famous Pachuca property will finally land with the Camp Bird company.

The sensation of the week in mining circles is the hot fight being made by Newman Erb to wrest the control of the Davis-Daly from F. A. Heinze. Both sides have sent appeals to shareholders for proxies for the annual meeting which is to be held next Monday. Erb is making his campaign for control on the plea that the Heinze management has been extravagant, and that the situation requires conservative handling.

The announcement is made in New York that James W. Malcolmson has been appointed consulting engineer for the Lucky Tiger Combination Co. The Lucky Tiger is the mine recently examined by Thomas H. Leggett and F. Hellman, under an option at \$6,250,000. The option was allowed to lapse. It is reported here that other interests are negotiating for the property.

The chief interest in the New York mining markets continues to be in the so-called 'porphyry' coppers. The only one of these stocks which has shown any weakness of late has been Ely Central. It is reported that the Calumet claim of this company is not developing as well as had been anticipated, although the Globe claims have been developing exceptionally well. The weakness in this stock is partly to be explained by the above reason, but it is also partly due to one of the largest shareholders selling out for the purpose of obtaining funds to start a market campaign on another 'porphyry' copper property upon which W. A. Farish has just returned a rosy report. The rumor that the Cole-Ryan interests are to consolidate the properties in which they are interested at Ely, is gaining currency, and it is believed that an announcement covering the matter will soon be made. The Cole-Ryan people, besides owning control of the Giroux, have, as is well known, recently obtained control of the Butte & Ely, and a number of other properties in the Ely camp. It is stated that a consolidation will be effected on a financial plan similar to that employed by the Nevada Consolidated Copper Co. some time ago.

At the office of the Exploration Company of New York, the announcement is made that the earnings of the Guanajuato Consolidated Co. for August were \$47,700, as against only \$6000 in February. The installation of filter-presses and other modern metallurgical devices, and a slight increase in the grade of the ore, have accounted for a regular monthly advance in the output of this mine.

Thomas W. Lawson has started a new campaign, having for its purpose the bulling of copper stocks. As a result of his campaign, this time not by advertising but by circularization, there is increasing activity in Chino and First National, and a broadening market. These are the two stocks which Lawson is particularly booming.

MEXICO.

Petroleum Refinery.—Cia. Minera de Naica. — Seguranza, Zacualpan.—Santa Gertrudis Negotiation.

The petroleum refinery of S. S. Pearson and Sons' is situated at Minatitlán on the Coatzacoalcos river, about 40 kilometers above the town of Coatzacoalcos. The capacity is about 5000 bbl. per day, and about 200 bbl. of asphalt. A plant is also being erected for manufacturing lubricating oils. The oil fields from which the crude oil is obtained are about 25 kilometers further up the river at San Cristóbal. There is another field at Concepción. The oil is obtained at an average depth of 800 ft.; there are no gushers, all are pumping wells. The Mexican Fuel Co. struck oil recently in a well on the Santa Fe ranch on the Panuco river, about 45 miles from Tampico, and 25 miles southeast from the Ebano oil fields. The well was drilled in four months, and oil was struck at a depth of 2455 ft. The well was drilled without casing, and oil was found in the hard rock at the

depth indicated.

It is stated that the large percentage of salt water pumped up with the oil from the Ebano oil fields was the cause of the shortage in the supply of fuel oil, for the locomotives on the National railroads. Experiments are being made for the mechanical extraction of the water from the crude oil. The contract with the railroad specified that there shall not be more than 5% of water with the oil, and recently the amount of water in some cases was as high as 20%.

The silver-lead mines of San Pedro, at Naica, State of Chihuahua, owned by the Cia. Minera de Naica, have been splendid dividend payers in the last two years. From the start, the gross output of ore has amounted to \$5,449,568, out of which \$2,650,800 has been paid in dividends. The property consists of 48 pertenencias, or mining claims, and a narrow gauge private railroad from the mines to Conchos station on the National railroad, about 80 miles south of Chihuahua. This narrow gauge has a length of about 27 miles. The high-grade ores so far shipped average about 400 grams silver, and 3 grams gold per ton, with 22% lead, 20 iron, and 10 lime. The company has decided to erect a 600-ton smelter at Conchos, which it is estimated will cost a million pesos. The plans for the plant are now being prepared, and while it will be designed with special reference to the ores from this mine, it will also be a custom smelter.

G. A. Waddell, acting for the Seguranza company, has recently purchased the Ampliación Norte de Olvidado, near Zacualpán. This mine has 21 pertenencias, and adjoins the Seguranza on the north, being between the famous Carboncillo and Coronas mines. The group of mines now owned by the Seguranza company are of such importance that this concern ranks as one of the most important in the district. J. W. Nibel is general manager of the company's mines at Zacualpán.

The sale of the Santa Gertrúdis property, which was reported as practically settled, has been again postponed as the result of an extraordinary meeting of the stockholders held at Pachuca on September 13. After much discussion the meeting was adjourned for 15 days so as to consider the rights of the majority stockholders, and also to give time for a commission to report on the actual conditions of the property. The commission appointed consisted of consulting engineer Edmundo Girault, Julio Limantour, and an attorney named Elguero. It is interesting to note that a short time ago Girault claimed that the mines were worth a great deal more than \$9,000,000, whereas the report made to the board by José Calero, shows a total value, including ore blocked, and probable ore, of \$10,210,840.

The Monterey-Tampico branch of the National Railways which was washed out by the recent floods will not be open for traffic for six weeks.

BUTTE, MONTANA.

September Copper Output.—Parrot Development.—Minnie Healy.—North Butte Troubles.—Murray-Switzer Case.

During 28 working days in September the Butte mines yielded 380,240 tons of ore, producing 26,584,180 lb. of copper, an increase of about half a million pounds over August. The companies are represented in the totals, showing daily averages of ore and copper production, and average yield of copper per ton of ore, as follows:

| Companies. | Daily Tons. | Lb. per Ton. | Daily lb. Copper. |
|--------------------------|-------------|--------------|-------------------|
| Boston & Montana | 3600 | 76 | 273,600 |
| Anaconda | 3600 | 62 | 223,200 |
| Butte & Boston | 650 | 63 | 40,950 |
| Washoe | 550 | 62 | 34,100 |
| Parrot | 400 | 58 | 23,200 |
| Trenton | 405 | 61 | 24,705 |
| North Butte | 1395 | 84 | 117,180 |
| Butte Coalition | 1500 | 72 | 108,000 |
| Original | 900 | 72 | 64,800 |
| Pittsburg & Montana..... | 380 | 65 | 24,700 |
| Miscellaneous | 200 | 75 | 15,000 |
| Totals | 13,580 | | 949,435 |

The Parrot company is still finding the richest ore of the

Parrot mine on some of the intermediate levels, especially on the 1600 and 1800-ft. The two new levels at the 1900 and 2000-ft. are not showing up well, but during the past month a new and splendid orebody has been opened on the 1800-ft. from which 'glance' ore is being mined. The Parrot vein has always been erratic in size and richness. On the new levels the vein has maintained a good size, but the ore is low-grade. The Parrot is not yet at the depth at which the Anaconda company, in the adjoining ground, found its richest ore.

The recent find in the Minnie Healey mine at a depth of 1700 ft. by the Butte Coalition company continues to improve with development. Four veins have been cut by the cross-cut from the 1700-ft. station of the Tramway shaft, two of the veins being new and not known to exist above the 1400-ft. level, where the apex was cut. The second of these veins, less than 170 ft. from the shaft, may be a branch of the Minnie Healey, but that has not yet been determined. It has a width of 6 to 12 ft., though it narrows at places to a foot. Driving is being done, and the ore in the entire width is said to average 36% copper, and much of it as high as 54 and 60. The main Minnie Healey vein, is also being driven on, though the vein has not yet been traversed. Ore in the face of the drift assays higher than 6% copper, though it is not expected that the entire vein will be found to contain such a high average.

James A. Murray, a millionaire banker, who has brought suit against the Anaconda company over the apex of a portion of the Bell-Speculator, or Edith May vein, is now engaged in a litigation by which he hopes to get control of the Butte Monitor Tunnel Mining Co. for \$20,000. A great deal of the stock of the company is owned by Easterners, but the majority of the 3,330,000 shares is, or was, owned by William S. Switzer, the original owner of the property, a feeble old hermit, about 85 years of age. Recently 1,500,000 shares of the stock owned by the old man was in danger of being sold by the sheriff to satisfy a judgment for \$17,500, and a money broker advised him to borrow sufficient money from Murray to pay off the judgment. He got \$20,000, and paid \$2500 of it for commissions, agreeing also, so he says, to pay a reasonable interest. He discovered that he agreed to pay \$10,000 for the use of the \$20,000 for four months, and now Murray is suing to enforce the transfer of about 2,200,000 shares which Switzer thought he had put up as collateral security. Murray claims that he bought the stock outright for \$20,000, and merely gave Switzer an option to repurchase his own stock for \$30,000. Switzer has repeatedly refused offers of \$75,000 to \$500,000 for his controlling interest in the company, but he is now in danger of losing it all for the \$17,500 judgment which Murray paid off for him. The company owns seven claims on the east side of the Butte district. A tunnel 1600 ft. long has been driven on one claim, cutting seven veins, giving at a depth of 200 to 300 ft., some fair copper and silver assays. Much of the stock of the company is owned in Ohio and New York, and the stockholders will probably be interested in the news that Murray may get control of the company.

The Eastern stockholders of the North Butte Extension Development Co. are still holding meetings and conducting investigations. A few weeks ago a committee of stockholders made a report but no serious recommendations or findings were made, so far as the Butte stockholders have heard. Notice was given later of another 'informal' meeting to be held in New York September 30 'for the purpose of inquiring into the affairs of the company'. This was sent out by Joseph O. Morris and E. S. Thatcher. It announced that F. O. Weeks, of New York, Dudley A. Tynge and A. M. Andrews, of Chicago, would be invited to be present.

The company has lost its options on the fractional interests in the Occidental, Free Trade, and Overman claims, but it owns some undivided interests in those properties, and owns outright two mill-sites and a small fractional lode-claim on which the company's shaft is situated. It is probable that the company can obtain a renewal of the expired options, if it ever gets into financial condition to indicate its ability to do business. It has no indebtedness, and a large majority of its stock remains in the treasury, but among all the new companies organized in the Butte

district none has been so unfortunately managed as the North Butte Extension. Its property is favorably situated, and the belief is general that had the company been given a fair chance by its officers it would have developed into a producing mine.

TORONTO, CANADA.

Provincial Mine Sold — Waldman Mine. — Colonial Mill. — Cobalt Output. — Buffalo Cyanide Plant at Cobalt.

The sale by the Ontario Government of the Provincial mine on the Gillies timber-limit has been effected, the price received being \$113,111. The purchaser was F. M. Connell, of Halleyburg, whose tender was the highest received. The mine was sold subject to a 10% royalty on the gross output. There is a good plant, including a 100-hp. boiler and an air-compressor with pumps, and two shafts down 140 and 70 ft. respectively, from the younger of which considerable driving and cross-cutting has been done. Fifteen other properties on the limit, also subject to 10% royalties, were likewise sold, which comprised a total acreage of 319 acres, realizing \$109,943. The highest price received for any lot was \$20,600, and the lowest \$2250. The recent discoveries on the Waldman property had a marked influence in stimulating competition, the bids being considerably higher than those received at the previous sale. So ends the Ontario Government's policy of operating mines, which will be a sore disappointment to the advocates of public ownership, who regarded Premier Whitney as a staunch upholder of their principles. It is understood that one of the main reasons which induced the Government to get rid of the Provincial mine was that the officials of the Department of Mines might be free to undertake a thorough exploration of the Gillies Limit, only the fringe of which has yet been gone over. As it comprises in all 64,000 acres, much of it still thickly wooded, this will be a difficult and tedious task.

The principal interest as regards Cobalt now centres around the Waldman silver mines. The organization of a company has been completed, and development, which is being vigorously pushed, has fully confirmed the promise of the surface explorations. The shaft is down 42 ft. in good ore. An assay of ore from the 30-ft. level showed 10,668 oz. silver per ton. Fifty men are engaged in surface trenching. Ore is being taken out at the rate of about 40 bags per day. At the Temiskaming the shaft is being put down from the 300 to the 350-ft. level.

After having installed a test leaching plant, which proved unsuccessful because of its small capacity and mechanical inefficiency, T. R. Jones, superintendent of the Buffalo property, at Cobalt, still maintained that cyaniding was essential to the most efficient treatment of the ore. After three months of testing it was decided to erect a slime-plant, and further experimenting was carried on. The cyanide plant, which is now in operation at the Buffalo has a capacity of 50 tons of dry slime per 24 hr. In the concentrating plant the ore is crushed and jigged and then classified for concentration in a drag classifier, designed by Groch Bros. The sand is concentrated on Wilfley, James, and Deister sand-tables, and all of the slime, including that formerly treated on the Deister slime-tables, is sent to the top of the cyanide plant, by a Morris centrifugal pump, where it is sampled by an automatic clock sampler, and passed through a screen into the collecting vats. The thickened pulp is drawn from the bottom of the collecting vat through a 6-in. pipe, and is deposited by gravity into the dewatering tank, which is fitted with vacuum filters. The cakes are dropped off of the filters and agitated by air with the solution and are then pumped back to the treatment-vats when it undergoes an agitation of 48 hr. This is done by means of mechanical and air-agitation combined. The filtering plant is of the vacuum type, with stationary, vertical filters of the style originally designed by F. G. Underwood in the Black Hills. The clear silver-bearing solutions through the vacuum pumps are pumped from the filter-tanks to the pregnant-solution tanks, from which they are drawn off to the zinc-boxes for precipitation. By means of zinc shavings in upward flow zinc-boxes, 95% of the silver is deposited, the remaining 5% being carried continuously in the

solutions. The recovery from the ore is 85%. The successful cyanidation of Cobalt ores opens up a new era for the camp, as lower grade ore can be treated. Frank Groch has been in charge of the operations and N. C. Groch has been assisting in the erection and installation.

GUADALAJARA, MEXICO.

Guanajuatillo Mine, Tepic.—*San Fernando, Durango.*—*Smelter at Choix.*—*Mina Grande, Hostotipaquillo.*—*Chapala Hydro-Electric and Irrigation Co.*—*Oro Grande Flotation, Guanajuato.*

The old Guanajuatillo mine, in the Territory of Tepic, has been partly unwatered by the Castellana Consolidated Mines, Ltd., of London, and good ore has been found in the old workings that can now be entered. The Guanajuatillo was at one time a rich producer, and according to its history high-grade ore was being secured when the workings were flooded and the miners driven out. The company has gone to considerable expense for unwatering the property, having installed a hydro-electric plant and electric pumps, but it expects to be rewarded when the deepest workings are emptied. The Castellana Consolidated was organized eight years ago to take over and work the old Castellana mines in Tepic, and it has been very successful in its operations. However, the Castellana mines are regarded as practically worked out, and attention is being centered on the Guanajuatillo. A reduction plant at La Playa, on the Santiago river, is also the property of the company. The Casados Mining Co. has secured control of the old Amajac reduction plant in the Hostotipaquillo district of Jalisco, and will use it for experimental purposes, preparatory to the erection of a 100-ton plant of modern construction at the Casados mines in that district. The Amajac plant has been owned by Carlos Romero, and has been doing considerable custom work. Stockholders of the Copper Range Mining Co., of Chicago, owning copper properties in the Autlán district of Jalisco, have brought legal action to secure an accounting from C. D. DuBois, the president and general manager. They charge that he has been neglecting the interests of the company. The company was organized a few years ago to acquire the Autlán properties, but little work was done up to last year, when development was resumed under the direction of Mr. DuBois. Soon after the organization of the company equipment for a 50-ton smelter was purchased and shipped to Guaymas, where it remained until early this year, when it was moved to the Jalisco port of Chamela and unloaded. A wagon-road from Chamela to the mines has been under construction. A. H. Harrison, an English mining man who recently secured an option to purchase the old Refugio mine in the Hostotipaquillo district of Jalisco for \$80,000, has allowed the option to expire. He took the contract to England, but failed to make a deal. Mr. Harrison owns the La Luz copper mines in the Ayutla district of Jalisco.

A report that a big body of ore averaging 1 oz. gold and 15 oz. silver per ton has been opened in a new working on the vein of the old San Fernando mines in the Topia district of Durango, not a great distance from the Sinaloa boundary, recalls the fact that the Fernando Mining Co., of Boston, after purchasing them for \$250,000 and spending several hundred thousand dollars in development work and equipment, made a present of these properties to John T. Canfield, of Culiacán, Sinaloa. Mr. Canfield has sold an interest in the mines to H. G. Zeigler, and a reduction plant it now planned. Mr. Canfield, a well known American business man of Culiacán, was authorized to sell the mining, hydro-electric, and reduction machinery that had been installed, and later the titles to the mines were turned over to him as a gift. New development has been in progress for some time, and according to late reports there is now promise that the mines will become big producers. It is expected that work will be resumed on the Kansas City, Mexico & Orient railway in Sinaloa soon after the close of the present rainy season. The line has been completed for a distance of 80 miles east of the port of Topolobampo. The Choix Consolidated Mining Co., of Los Angeles, plans to build a 100-ton smelter near the point where the railroad will cross the Fuerte river, about 125 miles from Topolo-

bampo. It will be a custom plant. A body of 8% copper ore, with a good silver content, has been opened in the Plátanos property of the Plátanos Development Co. in the Choix district of Sinaloa. The Plátanos ores will be treated at the Choix Consolidated smelter.

Francisco J. Fournier, the Frenchman who developed the great Dos Estrellas mine in the Talpujahua district of Michoacán, is one of the men behind the plans for the extensive development of the old Mina Grande in the Hostotipaquillo district of Jalisco. He has taken a big block of the stock of a company recently organized with a capital of \$300,000. The Mina Grande was recently purchased from the Dwight Furness Co., of Guanajuato for \$75,000, and since that time several adjoining claims have been bought from Frank G. Stevens and others for \$20,000. Mr. Fournier is the principal stockholder in the Dos Estrellas Mining Co., and his Dos Estrellas dividends have made him a millionaire. The Chapala Hydro-Electric & Irrigation Co. has secured a loan of \$2,200,000 from the Caja de Préstamos, of Mexico City, and part of the money will be spent on the transmission line from Guadalajara to the Etzatlán and Hostotipaquillo mining districts. The iron towers for the cables are being erected, and power is now promised Etzatlán concerns by January 1, 1910, and those of the Hostotipaquillo district by the following March. H. E. Crawford, representing the Marcus Daly estate, is shipping some high-grade ore from the Cinco Minas in the Hostotipaquillo district. The \$200,000 worth of development machinery recently ordered by Mr. Crawford has been unloaded at the present Southern Pacific terminus beyond Tequila, and some of it is on the way to the mines. Arrangements have been made for its immediate installation. A. J. Vick, of San Antonio, Texas, who last year purchased the old Deseada, Espada, and San José mines in the Hostotipaquillo district for \$150,000, has bought the Esperanza and San Pablo, extensions of the San José, from Alfred Lundvall for \$50,000. A reduction plant with an initial capacity of at least 100 tons per day will be built. The Peñoles Mining Co., owning the custom smelter at Mapimí, Durango, has purchased the Resolana, La Perla, and Dewey mines in the Parral district of Chihuahua, and shipments from the properties to the Mapimí plant will soon be in progress. The mines will give the Peñoles company a steady supply of silicious ores. The Llanitos Consolidated Mines Co. of St. Louis, Missouri, now in control of the Llanitos group of mines at La Portilla, Durango, is installing a hydro-electric plant to furnish power for electric drills and other mining machinery. A 50-ton stamp-mill and cyanide plant will be built next year. Plans for extensive development have been made.

The Cubo Mining & Milling Co., of Chicago, operating the Cubo group in the Guanajuato district of Guanajuato, has completed La Loca tunnel to the old Villapando mine, and that property will now be cleaned out and further developed. The tunnel was started many years ago by an English concern, and is one of the longest in the Guanajuato district. The present Cubo reduction works, consisting of 20 stamps, Huntington mill, concentrators, and cyanide annex, is soon to be replaced by a big plant of the most improved construction. E. N. Funston is now in charge of operations for the company. It is stated that the Securities Corporation, Ltd., which is handling the Oro Grande flotation, is meeting with success, and that money for the proposed operations in the old La Luz camp of Guanajuato will soon be available. The Oro Grande Mines Co. was recently organized to take over and re-open the old La Luz, Refugio, Bolañitos, Melladito, and Tolentino mines and build a reduction plant of 1000 tons capacity. In the event the flotation is a success it is probable that the Mexican Milling & Transportation Co. will build a railroad to give La Luz connection with the National Railways. This latter company was organized a few years ago to operate milling plants and build a belt-line to connect the principal mines and mills of the Guanajuato district with the Mexican Central, now a part of the merger system (National Railways). However, there is no doubt of the belt-line plans being carried out. A rich find was recently made in the Tajo de Dolores mine, which is controlled by the Proprietary Mines Co. Some of the ore assayed as high as 55 kilos silver and 240 grams gold.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Dredging on the Fraser River.

The Editor:

Sir—The fact that dredge mining on the Fraser river, British Columbia, has so far failed despite the enormous harvest of gold its bars yielded in the early history of the province has been a cause of wonder to mining men. At the present time the Fraser river is condemned as a dredging field by the majority of mining men who have examined it, for what might seem the good and sufficient reason that during the last 10 years several companies have operated and gone out of business. The Fraser river, in spite of all this, affords as good opportunities for dredging as many districts where the industry is on a sound, paying basis. I have been actively connected with the dredging industry on the Fraser river for over six years, and I have had several years' experience in New Zealand and California, so I feel that I can speak with some authority on the subject. Before dealing with the causes of the failure of dredging in this district, a few words on the auriferous deposits of the Fraser river will be necessary. Starting at Hope on the Fraser river, 88 miles from Vancouver, and extending to the town of Lillovet, a distance roughly of 120 miles, one finds at frequent intervals large gravel bars, some of them over 100 acres in extent. These bars in most cases show at low-tide, but during high-water, in the months of June, July, and August, are partly submerged. It was from the surface of these bars that the large amount of gold produced on the Fraser river during the last 50 years has come. Dredging on these bars at different points has shown the value to be from 10 to 25c. per cubic yard. The total available area for dredging should be close to 3000 acres.

To turn to the causes of failures: At Lytton the first so-called modern dredge on the Fraser river was built by the Cobeldick Dredging Co. in 1900. This company, disregarding the large gravel-bars lying above low-water mark built a dredge that could work only in the bed of the river. The best returns were obtained along the edges of the bars, and the operation with this boat proved that the gold was concentrated on the bars. Although in many respects this boat was capable of excellent service, in other ways it proved unsuitable; the gold-saving tables were inadequate, not having area enough for the scaly nature of the gold. Although alterations could have been made at a slight expense, the directors of the company decided to discard the dredge and build a new one. This dredge was supplied by an English company with very little experience in the business, and proved a total failure. The machinery was too light, no allowance being made for wear at all; the length of ladder only allowed it to dredge to a depth of 25 ft., so that a rise of a few feet in the river put it out of commission entirely. Furthermore, the dredge had so little freeboard that it was almost im-

possible to move it in the current. Only after weeks of delay, strengthening different parts, and altering others, was the dredge got to work; then all it was fit for was prospecting. Several bars were prospected with it, and the results were so encouraging that the directors made repeated efforts to raise capital to build another dredge, but the stockholders cried 'enough'.

The next company to operate on the Fraser river was at Lillovet. Unlike the Cobeldick company at Lytton, this company made provision to work the bars on their property, that they had prospected beforehand with highly satisfactory results. This dredge has been at work several years with varying success. The first season's run proved profitable, but litigation among the stockholders tied up the dredge for a lengthy period. This property has recently fallen into the hands of a Boston company which operated it for a season. This dredge is at present leased to a party of experienced dredge-men, who are working with satisfactory results.

In 1906 a third company was organized by one of the most successful dredge owners in New Zealand to work a 15-mile tract leased on the Fraser river at Yale. This company repeated the mistake of putting on a dredge without a stacker, and in not acquiring the right to dredge the bars. The unprecedented cold weather of that winter caused the dredge to be frozen in for some months, so eventually they were glad to sell to a company owning an adjoining bar-lease. The company acquiring this dredge operated for some months at a profit, but during a heavy freshet in the river the dredge was wrecked beyond all hope of salvage. I believe that the Fraser river offers today splendid opportunities to those looking for dredging property. The greater part of the area can be prospected with the Keystone drill.

Mention is often made of the difficulties met with in dredging on the Fraser river, and no article would be completed that did not refer to these. Most of these difficulties are found in the attempt to dredge the deep channels. In many places the bed of the river seems to be literally paved with rocks. While they can be handled by the dredge-buckets, yet they entail heavy wear and tear on the dump-chutes and grizzlies. In the bars, however, this feature is absent. Then the 'mush' ice running in the river in winter causes delay by choking the pumps and pipes. A dredge working in the bars, and away from the current, avoids this, and the same applies to the swift current at high-water. Another point is that the gold being of a scaly character requires a larger spread of tables to treat the material lifted, and a separate engine for the pump must be employed, so that the supply of water to the gold-saving tables can be regulated according to the character and amount of material being lifted. This was not done in two of the dredges referred to in this letter, and was a bad feature of their design. The working season should average 10 months. During the last 10 years there have been some when a dredge would only have lost a few days on account of cold weather. On the other hand, however, an exceptionally long cold winter might tie a boat up for three months.

Pierce, Idaho, August 10.

JOHN WATT.

MODERN PROGRESS IN MINING AND METALLURGY IN THE WESTERN UNITED STATES.

By DAVID W. BRUNTON.

*The more recent and important improvements in our Western mining practice which have contributed most toward the advancement of the art may be briefly summarized as follows.

Mine-Mapping.—Not many years ago most mining companies thought it amply sufficient to have a surface map of their properties and a composite map showing the different underground workings in their mines. Today, almost every important concern maintains, in addition to the above, both stope and assay-maps, while many of the larger companies add individual-level horizontal and vertical cross-section maps showing the underground geology in full. Upon these maps conventional designs in black ink are used to designate the various rocks, while the different veins or vein-systems are shown in colors. These sections are frequently drawn also upon glass sheets, which are then inserted in wooden frames provided with vertical or horizontal slots or grooves cut at the proper relative distances apart to correspond with any desired planes of cross-section or with the working levels of the mines in question. The great advantages of such plans and sections cannot be overestimated. They not only show at a glance the tonnage and value of the ore in sight, but also afford a guide for development, whereas the old-fashioned maps were nothing but a record of the work performed, and were practically useless for any other purpose. The improvement has led to another advantage the importance of which is just beginning to be recognized. I refer to the employment by large mining companies of economic geologists, who are not burdened with the duties of surveying, directing workmen, etc., but give their whole attention to the geological problems found in the work. The advice of such experts in the purchase of property, the running of exploration-drifts, the location of shafts, etc., and the interpretation of local fault-systems, and other structural features, has already proved of inestimable value to their employers.

Surface Mining.—Large orebodies occurring near the surface can, in many cases, be most cheaply and satisfactorily mined by stripping off the overburden and loading the mineral into cars by either the 'milling' or the steam-shovel system. In the West, steam-shovel mining is confined almost entirely to the low-grade copper deposits at Ely, Nevada, and Bingham, Utah. The system employed follows closely that of many iron mines of Minnesota; and 95-ton shovels, with 3.5 cu. yd. (7-ton) dippers, are in common use. At Bingham, the Boston Consolidated Co. stripped the overburden from its deposit at the rate of 200,000 tons per month. The maximum amount handled in a calendar month was 282,903 tons, in August 1907, and the maximum output for a single day, with four shovels, is 15,000 tons. The Utah Copper Co., immediately adjoining this, is also carrying on equally extensive stripping and mining; and as many as 13

steam-shovels and 26 locomotives have been counted at work within a radius of half a mile.

Rock-Drills.—The great improvements in core-drills, both diamond and calyx, enable us today to explore ground hundreds of feet in advance of the actual openings, and afford great aid in all development. Power-drilling has now almost entirely replaced hand work, and a vast assortment of drills has been placed on the market, from which a careful engineer will often have extreme difficulty in selecting the machine best adapted for a particular service. Rock drills, reciprocating, air-hammer, and electric-air, are all in successful operation today; and with the steady improvement, both in design and material employed in construction, there is every reason to believe that the drill of the near future will be even more nearly perfect than those now in use.

Hoisting.—Thirty years ago, while immense hoisting plants were in use on the Comstock, they were far from efficient, and were not copied even in miniature on smaller mines. The favorite plant in Colorado in the early days was called the Gilpin county hoist, and consisted of a drum securely fastened at one end to a large wooden pulley connected by a slack belt to a stationary engine running continuously at a slow speed. When the signal was given to hoist, the operator opened the throttle of the single-cylinder engine and brought the necessary working tension on the belt by means of a tightener operated by a hand-lever. Today these primitive machines, large and small, have all been succeeded by direct or gear-connected steam engines, equipped, whenever the tonnage is sufficient to justify the expense, with variable cut-off valve-gear, post-brakes, and every modern improvement. Steam-hoists, capable of handling from 10 to 20 tons of total load, from depths of from 4000 to 6000 ft., at speeds varying from 4000 to 5000 ft. per minute, are now not at all uncommon. These immense plants are fitted with every imaginable device for increasing the efficiency, rapidity, and safety of operation, and the skill and artistic ability displayed in the design of some of the later Nordberg creations bring them to a point where they can almost be considered works of art. In many places where water fit for use in boilers is scarce and electric current cheap, as at Cripple Creek, the electric hoist has almost completely replaced the steam-hoist. When large electric hoisting plants were first installed it was found that the great amount of current necessary to start and accelerate the load brought a very objectionable 'peak' on the transmission line. This difficulty has now been overcome by the Illgner and other similar systems, in which the energy stored in a large rapidly revolving fly wheel cuts down, if it does not entirely prevent, the objectionable peak. Safety devices likewise have been very much improved; and a recent invention, whereby the cage tender is in constant connection with the engineer, should do much to decrease the number of shaft accidents.

Underground Tramming.—When mines were shallow, shafts numerous, and hoisting facilities inadequate, hand tramming was almost universally employed, but with increase in depth came the necessity for better hoisting machinery and a reduction in the

*Presidential address before the Spokane meeting, September 1909, Amer. Inst. Mining Engineers.

number of shafts, thereby increasing the distance over which ore had to be trammed. Then it was found that a high priced man constituted a very expensive motive power for pushing cars; horses and mules were put into commission; and, still later, air and electric locomotives have come into very general use. There has been much discussion concerning the relative merits of the two latter systems of underground haulage; but there is no doubt that each has its own field. Where the openings are dry and the roof sufficiently high and firm to carry the trolley-wire insulators, there is not question as to the desirability of using electricity, but where these conditions unfortunately do not obtain, the compressed-air locomotive is an excellent substitute.

Timbering.—Where the orebodies do not exceed 10 or 12 ft. in thickness, and have a firm hanging wall, nothing can exceed the cheapness and simplicity of stulls; but when larger orebodies are opened and timbering is necessary, the system employed is that of square setting, invented by Deidesheimer and first used at the Ophir mine on the Comstock lode in 1861. Timber is yearly becoming more expensive, does not usually last well underground, and when the orebodies are large, especially if there is a tendency to movement in the walls, square sets made from square timbers are apt to 'swing' and afford little vertical support. When large quantities of timber are required for square setting, in situations where the distance from the forest to the mine is not too great, round timbers are much cheaper and more durable than square. A round log has about double the strength of a square timber cut from the inscribed square on its small end; and since, in the round log, the concentric rings of growth are unbroken and each protects the ring immediately underneath it from decay, the comparison, both in cost and in durability, is very unfavorable to square timbers. Automatic framing machines can now be had which utilize the full strength of round timbers by making a bevel-joint outside of the square tenon necessary in all square set timbering. This additional segmental contact-area in the joints braces the round timbers so that they are much less liable to 'swing' in large stopes than the square.

In some cases 'cut and slice' and 'caving' methods are employed, in which the hanging wall is allowed to come down and rest on each successive floor as the ore is stoped out, and is prevented from mixing with the ore by a mass of crushed timbers and plank which follows down on the top of the receding ore. In the Utah Copper and Boston Consolidated mines, at Bingham, Utah, about 4000 tons of copper ore are mined per day by the 'caving' system. In some large mines the stopes are filled with waste as fast as they are freed from ore, and the ground above thereby prevented from caving, in the same way as if stulls or square setting were used. Steel and concrete are coming slowly into use in shafts, stations, and tunnels, and with the natural decrease in the price of iron and cement on the one hand and the rising cost of timber on the other, it is easy to see that the more durable forms of construction will eventually supersede wood on all permanent work.

The direct-replacement system employed in the

Rio Tinto copper mines in Spain succeeded perfectly in holding both walls and surface in place on a vein from 200 to 260 ft. wide, and, by taking advantage of the wonderful skill of the Spanish miners in building dry stone walls, gives a new method of safely and economically mining the lower portions of the lodes which cannot be reached by the open-cast systems extensively in vogue there.

Pumping.—In the United States during recent years the direct-connected steam pump has been developed into a most efficient pumping machine with duplex, triple expansion engines and every refinement possible in modern steam engine practice. These have in many places been superseded by the electric-driven plunger-pump, in which the high speed of the electric motor has been reduced by suitable gears. Later, quite a large number of electric pumps have been built in which the gear is entirely eliminated. The speed of the motor has been reduced, and that of the plunger raised, forming a combination known as the express pump. Pumps of this class, with capacities of 1600 gal. per minute, raising water 1550 ft., are now being successfully employed in unwatering the Comstock Lode at Virginia City. Within the last few years great improvements have been made in the electric-driven turbine pump which, with its entire absence of valves and reciprocating parts, promises to become a dominant factor in high-lift pumping. Already we have single-stage turbine pumps raising 35,000 gal. of water per minute 150 ft. high; five-stage pumps raising 10,000 gal. per minute 600 ft.; six-stage pumps raising against 800 ft. head; and eight-stage pumps raising 400 gal. 1400 ft.; and responsible firms are ready to contract to raise water by this system to any elevation up to 2000 ft., and guarantee a pump efficiency of from 60 to 75%, according to conditions of service.

Lighting and Signaling.—Incandescent electric lighting has long since driven oil lamps and candles out of the underground stations and permanent levels in which any large amount of work is carried on. The recently invented tungsten lamp with its high efficiency, giving 20 c.p. with an expenditure of only 25 watts per hour, makes it economically possible to extend electric lighting very greatly throughout underground workings. In some of the largest and most progressive mines, candles and oil lamps have already been replaced in the stopes by acetylene, which is not only cleaner and safer, but gives a much greater illumination for a given cost. For mine signaling, the flash-light system operated by interrupting, by means of well protected switches, the current passing through the station lamps, is rapidly replacing the old fashioned cumbersome bell cord; and the latest moisture proof mine telephone gives instant communication throughout the underground workings, and to and from the surface, with little danger of interruption.

Explosives.—The use of modern high explosives in mining and tunneling is now universal; but there is a crying demand for an explosive which can be more safely handled, and which on explosion or detonation will produce a smaller amount of noxious gases, which not only injure the health of the miners, but delay the resumption of work after each round of

shots has been fired. Irregularities in the composition of explosives, variations in the strength of detonators, and differences in the speed of fuses are all fruitful sources of mine accidents; and, while too much 'paternalism' is certainly to be avoided, it is doubtful if anything short of Government regulation and inspection of explosives, detonators, and fuses will ever bring about the uniformity necessary to safety.

Ventilation.—Less progress has taken place in this department than in almost any other, although the means for moving large quantities of air under slight pressures have been very much improved. The ventilation and cooling of metal mines have not yet received the attention which their importance demands. In this respect Western engineers could take profitable object lessons from their brethren in the coal-fields. Very few of our Western mine operators go to the trouble of recording temperatures and making ventilation maps, showing the direction of the air currents, etc., all of which data are necessary before a satisfactory system of either natural or artificial ventilation can be planned. As most of the Western mines are in hilly or mountainous situations, it is generally easy to provide two openings at greatly different elevations, so that the heating effect of the workings can be depended upon to control the direction of the air currents to such an extent as at least to cool and ventilate the workings partly. When these advantages cannot be obtained, centrifugal or forced-draft blowers, driven either by steam or by electricity, furnish an easy means of obtaining the desired results. The latest high speed electric direct-driven centrifugal compressors give pressures up to 45 oz., and have been built in sizes up to 40,000 cu. ft. of free air per minute; but there is apparently no limit to the size of the machines which can be built under this system.

Tunneling.—As the United States continues to grow in wealth and importance, tunneling operations increase in like proportion, both in number and in magnitude. New York City and its environs are now underlaid by a network of tunnels, and other cities are rapidly developing underground systems, since through the increase in population business and travel become congested. All over the United States water supply, hydro-electric power, and the reduction of grades on railways are requiring new and expensive tunnels, to which, in the West, are added the great irrigation tunnels called for in both Government and private enterprises. The result of all this activity in tunneling has been a vast improvement in both machinery and methods, and a greatly increased number of thoroughly trained and skilled workmen, so that records formerly unattainable in the United States are now being made in widely separated localities.

Dredging.—Chain-bucket dredging for gold was first attempted in 1867 in Otago, New Zealand, and the first steam actuated dredge operating on this principle was built on the Molyneux in 1881. From a few small dredges copied after those in use in New Zealand, gold dredging in this country has grown into a great industry, which is carried on successfully from the frozen gravels of the Arctic to the sun

scorched riverbars of the tropics, and at all altitudes from 10,000 ft. down to sea-level. Under stress of competition and the necessity of meeting new conditions, dredges have grown both in capacity and efficiency to a point not even dreamed of a few years ago. Dredges are now built with close connected buckets, of capacities up to 13.5 cu. ft., and capable of handling 10,000 cu. yd. of gravel in 24 hr.; some have been built with bucket-ladders capable of digging 67 ft. below the waterline and 20 ft. above it. A new stacker now under construction will deliver tailing 160 ft. away from and 60 ft. above the deck of the boat. Improved construction and better man-



Gold-Washing in the Middle Ages, (From Agricola)

agement have rendered dredging operations less dependent upon weather; and last winter in Colorado a dredge was operated continuously at an altitude of 9990 ft. where the temperature on several occasions fell to 20° below zero.

Electric Transmission.—No sketch of this kind would be complete without some notice of the immense service which the mining industry is receiving from long distance electric transmission. While a few mines are favorably situated for the utilization of adjacent water power, many of the principal mining districts of the United States are at altitudes so great that any available water power is far below them. Again, as in the case of Nevada, Arizona, and portions of Utah, the mines occur in an arid country where it is difficult to obtain sufficient water for domestic purposes, to say nothing of power. Already the electric current is carried to all elevations from sea-level to timber-line, and there is scarcely a desert

mining camp of sufficient size to justify the erection of a pole-line that is not equipped with electric power. The ease with which this overcomes the old and apparently insurmountable problems of scarcity of water and fuel constitutes one of the delights of modern mining. The use of electricity has also completely solved the old vexed problem of underground sinking and hoisting, so that these operations are now as readily carried on from deep tunnel levels as from the surface. Transmission lines of all lengths up to 220 miles are in daily use, with carrying capacities ranging up to 40,000 kw. Long-distance transmission systems are in many cases operated at 100,000 volts, and new lines are building to utilize even higher pressures. Recent improvements in insulation promise to make still higher voltages possible, which would mean a corresponding increase in the distance to which current could be profitably carried.

Sampling.—Few departments of mining engineering have shown greater advance than ore-valuation. In milling and concentrating plants, where fine crushing is a necessary preliminary, sampling is a comparatively easy and reasonably accurate operation, but where the ore is to be treated in the blast-furnace, crushing of any kind is objectionable and fine subdivision is prohibited. Forty years ago, for the valuation of coarse ore, 'grab' sampling was in common use, and this method was replaced in slow succession by Cornish quartering, fractional division, and split-shovel sampling. Then came automatic sampling in many forms, but all taking a portion of the ore stream continuously. In 1884 a new system of sampling was invented which automatically deflects the entire ore stream for a varying portion (usually one fifth) of the time into the sample division. Numerous different machines working on this principle are now in use; and these types of sampling plants have been perfected to such a degree that where the hopper ore-cars which are now coming into general use are employed, ore may be unloaded, crushed, sampled, and re-loaded into the outgoing cars, and the ground sample delivered in a locked steel box, without ever having been handled—the entire chain of operations being performed automatically.

Concentration.—The separation of valuable minerals from worthless gangue must have been one of the earliest operations in the history of metallurgy. Up to less than 100 years ago the pan, tub, and inclined plane, which are all so graphically illustrated by Agricola, continued to be the only devices in use. Hand-jigs were first introduced for the separation of coarser particles than could otherwise be handled, and the principles involved are in use today, although improved mechanical appliances have changed and enlarged operations to such an extent that the primitive origin would scarcely be recognized. About 35 years ago the use of air as a concentrating medium was successfully introduced, and, despite its many disadvantages, this system, assisted by numerous mechanical improvements, still exists and manages to hold its own where water is unobtainable or, for some reason, cannot be used. In skillful hands, some of the pneumatic separators give wonderful results, but the delicacy of the adjustments and the attendant

dust will undoubtedly prevent any extensive employment of this method. The pulsating water current recently applied by a distinguished investigator to the concentrating field has already won a place for itself in both sizing and jigging operations, and promises to become a most important factor in concentrating work. Specific gravity is, however, no longer the only principle taken advantage of in mechanical ore sorting. To these have been added magnetic and static electric separation, and many different methods based on the surface tension of water (with or without the assistance of oil or acid), resiliency, and affinity for grease. The latter method, used very sparingly in this country, finds its chief application in South Africa, where it is used in the separation of diamonds from other stones. The recent discovery by Kunz and Baskerville that the use of the ultra-violet light would enable an observer to determine by inspection, with reasonable accuracy, the percentage of willemite in tailing from concentrators, has already found commercial application on a very large scale, and opens up a wide field for speculation as to what the future may hold in store for us in this field. The enormous size of some of the new concentrating plants erected in the West exemplifies in a marked degree the magnitude of the operations now being carried on. At Anaconda, Montana, the Amalgamated Copper Co. has an eight-unit concentrating plant, each section of which handles 1000 tons in 24 hr.; and some of the new plants at Ely, Nevada, and Garfield, Utah, are but little smaller in size.

Roasting for Blast-Furnace Smelting.—The earliest roasting furnaces to prepare sulphide ores for blast-furnace smelting were small hand operated reverberatories, with or without fusion hearths. These were followed by revolving cylinders and various types of mechanically operated reverberatory furnaces, all of which were not only expensive to operate and keep in repair, but yielded a product very badly adapted to blast-furnace work. Today these old fashioned furnaces, both hand and mechanical, have been almost entirely superseded by blast systems like the Huntington-Heberlein, Carmichael-Bradford, and Savelberg, which make it possible to utilize the many advantages of blast-furnace smelting for the treatment of concentrate, fine ore, and flue-dust at very low preparatory costs. These systems marked a wonderful advance over the old reverberatory roast with its pulverulent product; but they were still open to the serious objection of requiring a large amount of manual labor in charging and discharging the pots and breaking up the sintered product. In spite of this drawback, the results obtained were so desirable that study and invention along these lines have been stimulated to such an extent that there are already in use mechanical roasting and sintering-plants (system of Dwight and Lloyd), to which ore can be fed in a steady stream, and which will automatically deliver a desulphurized, sintered, and broken up product in the best possible condition for blast-furnace work.

Lead Smelting.—Progress in this department of metallurgy during the past decade, in the West, has been much hampered by three conditions: (1) all the lead smelting plants operate almost entirely on

custom ores; hence the supply is irregular in volume, grade, and composition; (2) the great extension of the leasing system throughout the West tends to bring ore into the market in very small lots, thereby increasing the difficulties and cost of storage and bedding; (3) eight years ago nearly all of the principal lead smelting plants in the United States passed into the hands of a corporation organized for that purpose, and the industry was thereby deprived of the stimulus of healthy competition. The largest lead furnaces in the United States have hearths 180 by 44 in. and treat daily from 150 to 225 tons of ore, according to its character. Mechanical charging is used in some cases; but while it slightly reduces operating costs, it is no improvement metallurgically. In Australia, where different conditions prevail, the improvements in lead furnaces have kept pace with those in iron and copper smelting.

Reverberatory Copper Smelting.—In 1867, when Richard Pearce (afterwards president of the Institute), built his first reverberatory furnaces at Black Hawk, Colorado, they were considered the acme of metallurgical perfection, and their successful operation did wonders for the mining industry of the State. The hearths of these furnaces were only 8 by 12 ft. in size, and their daily capacity was 12 tons. As the quantity of ore produced increased and the necessity for handling larger tonnages became apparent, the reverberatory furnaces have been steadily enlarged and improved, until today they have attained almost incredible dimensions, having a hearth area of 19 by 116 ft., and a daily working capacity of more than 300 tons, which, in the case of easily smelted ores, has risen to over 400 tons. These large furnaces secure great saving of heat and uniform, continuous operation, for reasons into which I need not enter here.

Blast-Furnace Copper Smelting.—The early water-jacketed blast-furnaces for smelting copper ore were small, round, wrought-iron affairs, about 30 in. in diameter, and rarely smelted more than 12 tons of ore in 24 hr. From this puny beginning, keeping pace with the rapidly growing copper industry of this country, furnaces have increased steadily in size and improved in mechanical construction, until they have reached the enormous dimensions of 87 ft. in length by 4 ft. 8 in. in width, with a daily smelting capacity of 3000 tons of charge. These furnaces are mechanically fed, work under an air pressure of 40 oz., and give infinitely less trouble than their smaller progenitors. The water-jackets are completely sectionized, and it is possible to renew most of the sections without stopping the furnace. At first only one tier of jackets was used, then two tiers came into use, and now some of the most recent furnaces have air or water-jackets replacing the brick superstructure, thus doing away with much of the roof accretion nuisance. On furnaces built with a crucible, baby water-jackets have replaced the old cast-iron plates, and water-jacketed nose pieces have greatly lengthened the life of the furnace discharge spouts. The credit for the latest improvements in design and increase in size of both reverberatory and blast-furnaces is due principally to E. P. Mathewson, whose untiring energy as an investigator and skill as a metallurgist have made the Washoe plant, at Anaconda,

the Mecca for progressive engineers from every country. The recently invented acetylene blow-pipe promises to be of great service to blast-furnace engineers, as through its use it will soon be possible to obtain welded water-jackets entirely free from the objectionable lap seams and rivets.

Electrical Smelting.—A great amount of experimental work has lately been carried on by engineers in various parts of the world having for its object the utilization of the electric current in metallurgical operations, and there is no doubt that in the near future many minerals now smelted with fuel will be reduced to metals by electrical processes. The electric current possesses the great advantage of allowing a most efficient utilization of the heat; and also complete control of the exposure of the molten metals to air or gases.

Briquetting.—At many blast-furnace plants the fine is made into briquettes with the ordinary die-and-plunger machines; but if free acid or copper sulphate be present, the surfaces of both dies and plungers are rapidly corroded, which obviously increases the diameter of the dies and diminishes that of the plungers. As this solvent action continues, a point is soon reached when the plunger no longer fills the die opening, and pressure forces the material through the space between them, instead of consolidating the mass. When a sufficient amount of plastic material, such as slime, can be obtained to mix with fine ore and flue-dust, so as to give the mass the property of flowage under pressure, it may be briquetted in machines similar to those used in making building brick by the 'stiff-tempered' process. Solvents do not interfere with the operation of these machines, and by constructing the working parts of steel and phosphor bronze, it is possible to make briquettes dry enough to pass directly into a blast-furnace at the rate of 600 to 800 tons per day for each machine employed, at a cost of less than half that of the die-and-plunger system.

Chlorination.—Chlorination is confined almost entirely to sulphide gold ores having so little silver that its loss may be disregarded, and which require a preliminary roasting before treatment. The early methods of tank leaching have been superseded by barrel chlorination, and in some of the latest plants chlorine is produced by electrolysis instead of by the decomposition of bleaching powder with sulphuric acid. The largest plants operating under this system treat custom ores, and the stress of competition, together with the necessity of handling constantly increasing tonnages, has brought about great improvements in both machinery and methods. The most desirable features of this process of gold extraction are the high percentage recoverable, and the rapidity with which clean-ups can be made, rendering it easy at all times to know exactly what results are being obtained. The largest plants operating under this system are situated in Colorado City, Colorado, where two mills owned by one concern have an aggregate capacity of 800 tons per day.

Cyanidation.—While the first patent for extracting gold from its ores by cyanide solutions was issued in 1867, it was not until McArthur and Forest took it up in 1889 that practical results of any value

were obtained. Since that time the use of the process has increased by leaps and bounds in all of the principal gold producing countries, and today it is the principal factor in the world's steadily increasing gold production. Cyaniding seems to work with equal facility on raw ore, roasted ore, and tailing, and with the steady improvement in the mechanics as well as the chemistry of the process, it bids fair to do even greater things in the future than it has done in the past. Nor is its use confined entirely to the extraction of gold. In many districts it is operating with great success on mixed gold and silver ores. At Millers, Nevada, two plants with an aggregate capacity of 700 tons per day are operating on Tonopah ores, in which the average ratio of silver to gold is 80 to 1. The largest and perhaps the most complex cyanide plant in the United States is the Golden Cycle mill, at Colorado City, Colorado, which has a daily capacity of 1000 tons, and treats exclusively Cripple Creek ore, all of which requires careful roasting and very fine crushing. The Homestake cyanide mill handles a larger tonnage, but treats only tailing. Next to this plant in point of size and importance, and handling ore of much higher grade, is the new mill of the Goldfield Consolidated Co., of Nevada, which has a capacity of 600 tons per day, and contains the very latest improvements, culled from American, African, Australian, and Mexican practice.

Fume Recovery.—No department of metallurgy has made slower progress than this most important division, but now, through an unholy alliance between the unscrupulous contingent fee attorney and the greedy land owner, the success of 'smoke-farming' is compelling the smelting companies to do for self preservation something which they should long ago have undertaken for profit. Out of the almost numberless devices which have been tried for fume recovery, the bag house affords the best solution of the problem yet devised. Bags were used for the recovery of both zinc oxide and lampblack more than 50 years ago, but were not used for fume recovery until 1878, when Bartlett set up a small plant at Portland, Maine. The first large successful installation of this kind was erected by the Globe Smelting Co., in 1885, and has been in continuous operation ever since. While the bag house has been eminently successful in the recovery of blast-furnace fume, it cannot be used on fumes from reverberatory roasting or smelting furnaces, owing to the fact that a portion of the sulphur dioxide formed by the oxidation of the sulphur is raised to sulphur trioxide by contact with incandescent ferric oxide. At the United States Smelting Works, in Utah, provision for protecting the bag house from sulphur trioxide is made by blowing into the flues zinc oxide, which immediately absorbs the sulphur trioxide present to such an extent that it has been found quite possible to use cotton bags. The bag house has proved very efficient in recovering fume from lead refineries and all lead smelting operations excepting roasting. In large copper smelting plants, where large volumes of gas are produced carrying a sufficient amount of sulphur trioxide to destroy woven fabrics, three systems are in use—namely: radiation, decreased

velocity, and friction—and in many cases two or more of these methods are combined. At the Washoe plant, in Anaconda, long steel covered flues of enormous cross-section have been installed for a number of years, and, while this system does not effect a complete recovery of the fume, it is as nearly perfect as it is possible to make a plant today. At Great Falls, Montana, the Boston & Montana Co. is installing the friction system at a cost exceeding \$1,000,000, which includes the construction of a stack 506 ft. high and 56 ft. in diameter and a dust chamber in the flue system, of such width that the furnace gases will pass through it at a velocity considerably less than 500 ft. per minute. From the roof of this flue chamber more than a million steel wires will be suspended, an arrangement which experiment has shown to increase greatly the settling efficiency of the dust chamber. This installation is practically completed, but it will be some time before the results obtained can be accurately determined. I need not add that where (as in some Eastern works), metallurgical and commercial conditions permit the manufacture of sulphuric acid from the fumes, this method offers special advantages.

Conclusion.—The subjects already alluded to occupy but a small portion of the field covered by our 4000 widely scattered members, but I hope that enough have been mentioned to serve as topics for discussion at this meeting. The ever widening range of operations, the constantly expanding magnitude of mining undertakings, and the continually increasing complexity of both machinery and methods are daily creating new openings for mining engineers. To meet this demand our technical schools and colleges are yearly sending out an increasing number of graduates, whose opportunities and responsibilities will be even greater than those of the engineers controlling the activities of today. Even now, one change very much to be desired is beginning to become apparent. Heretofore it has too often been considered that an engineer's accountability ended when he discharged his full duty to his employer. Today we are beginning to realize that the public forms a third party, vitally concerned in the results of the work in which mining engineers are engaged. As large investments are usually held by divided ownership and stocks are often scattered far and wide, so that the owners of small holdings have little or no opportunity to become conversant with the exact conditions of the properties they represent, an engineer's first duty should be to see that no word or act of his can be construed so as to give one man an opportunity to take advantage of, or mislead, another. Everyone, no matter what his station, has a duty to society and his fellow men which can never be either ignored or neglected. The employer, whether an individual or a corporation, is entitled to all of the information and data which experience, diligent investigation, and careful study can bring to light, and while an engineer has a right to state probabilities from both indications and analogy, he should never assume the gift of prophecy and thereby delude both himself and others. Finally, a career has been a failure except one can say 'No man is poorer because I am richer'.

GAS ENGINES.

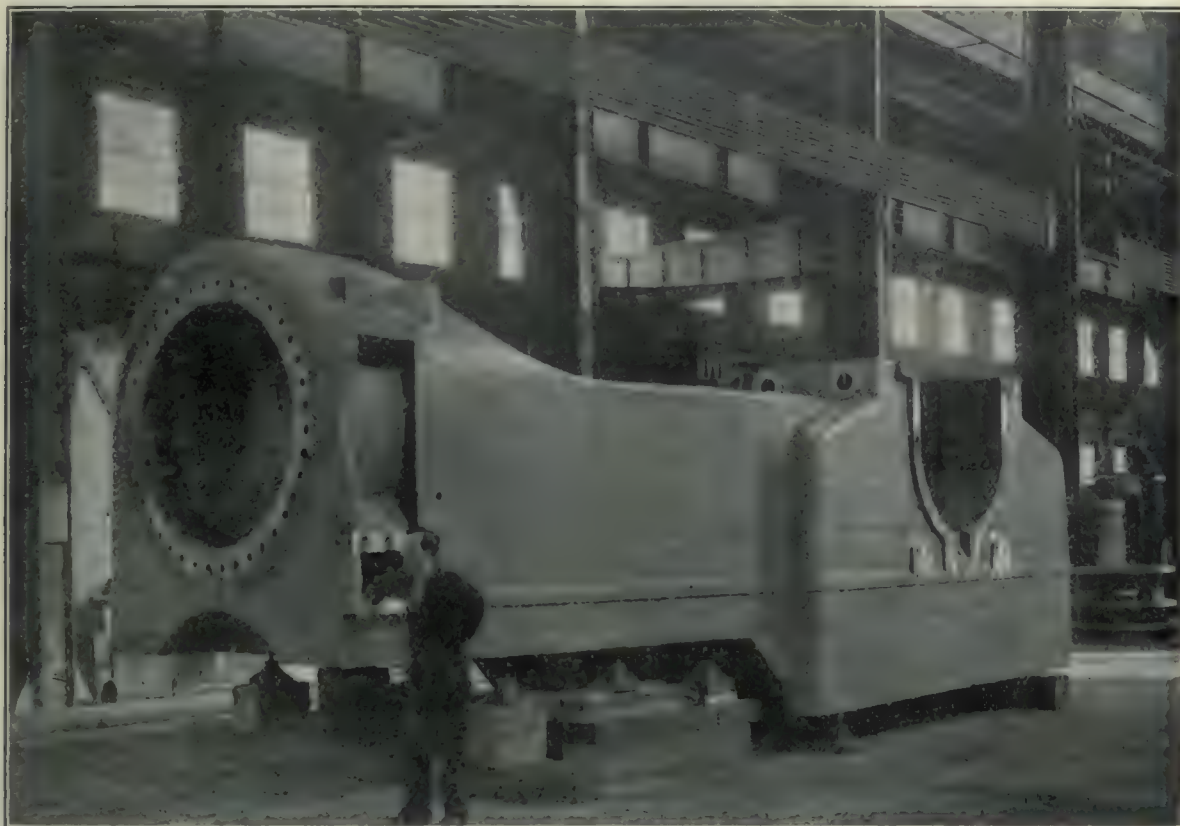
Written for the MINING AND SCIENTIFIC PRESS
By MARK B. LAMB.

When it pays the Steel Corporation to use gas instead of steam engines, though coal costs it far less than it costs the metal miner of the West, it would seem advisable for the latter to at least look into the matter. The huge steel plant at Gary, Indiana, has a number of such gas engines deriving their power from blast-furnace gas of low heat value, which would otherwise be burned under boilers with much less economy. The purchase of this equipment of gas engines was the largest single order for this class of engines ever placed in this country and was for the largest engines of this type ever built. The steel in-

tion alone required 2300 freight cars for its transportation.

The gas supply for these engines contains 27% CO and the estimated 45,000,000 cu. ft. daily capacity of the battery of blast-furnaces would generate 500,000-hp., if used exclusively in gas engines. Accompanying diagrams show graphically the great difference between gas and steam engines as regards thermal efficiency. Tests of the engines already in operation show an actual thermal efficiency of 23 to 24% and better results are expected when the complete plant is in operation. Of the amount of gas stated above, only 57% is destined for use in the engines, the remainder to be used for the various heating processes in the plant.

One great improvement in the design of the mod-



Cylinder-End, Gas Engine Frame, 2500 Kilowatt Unit.

dustry of this country as a whole is today operating gas engines totaling 400,000-hp. A few years ago it was the fashion to decry the conservatism of American steel makers while lauding the Germans. Now the conditions are reversed and though the manufacturer here has been slow in accepting the gas engine, he has profited by the experience on the other side.

The Gary plant of the Steel Corporation includes 33 of the largest units. Of these, 17 are twin engines with four cylinders 44 by 54 in. They are of the four-cycle, double-acting type, and the arrangement of the cylinders gives two impulses per revolution. The 17 are direct connected to 2500 kw. alternators. The other 16 provide compressed air for the blast-furnaces and are direct connected to 'Slick' blowing 'tubs' of special design. They deliver 30,000 cu. ft. of air per minute each against 18 lb. pressure. A total of 150,000-hp. of these engines has been ordered to date. The shipment to the Steel Corpora-

ern gas engine is shown in these machines in the perfection of governing and of uniformity of revolution attained. For the work of running alternators, governing must approximate perfection. Compressed air is used for starting, and on account of the four cylinders the start can be made from any position. Even with the tandem, double-cylinder unit engine, the high compression prevents the engine from stopping on the center, and no difficulty is experienced in starting.

The cleaning of the gas has been given careful attention. The Thiessen washer is one of the interesting machines of this series. Briefly, it consists of an outer cylinder and an inner revolving drum. The inner drum is provided with vanes which throw the gas against the inner surface of the cylinder which is kept continuously flooded with water. The last remaining particles of dust are thus thrown from the gas against this film of water, and removed.

Although, as has been said, this group of engines

is the largest, nevertheless, a multitude of power users are saving by means of producers and gas engines. The Port Washington, Wisconsin, power-plant of the Milwaukee Northern Railway Co. has two double-acting, twin, tandem gas engines of 2000-hp. connected direct to two alternators. The valve-gear is of the standard A-C Co. stratification type, the engines operating with constant compression and governing by variation of the amount of gas admitted. A modern Loomis-Pettibone producer-plant furnishes a gas of 125 B. T. U. per cu. ft. The producers operated with a down-draft avoid the use of an auxiliary equipment for extracting tarry products from the gas. Any soot which is formed in the gas of such a producer is removed with much less difficulty. Such a producer makes a gas containing over 80% of the heat units contained in the fuel used. In the every day operation of the plant, reverse runs of steam are made at regular intervals, which adds a quantity of water-gas of high heat value to the gas-holder mixture. The effort with all producers using coke and charcoal is simply to reduce as large a proportion of the fuel to CO as is economically possible. The less the fuel burned to CO₂ and the less the radiation and other heat losses, the higher the efficiency. When wood, peat, lignite or bituminous coal is used as fuel, part of the gas produced consists of hydro-carbons, varying in formula with the chemist analyzing. Besides the combustible constituents of the gas, nitrogen and carbon dioxide are present.

As the smaller engines, ranging from 200 kw. capacity upwards have been placed on the market, power users, other than street railways, have begun to appreciate and obtain the advantages of this method of generating power, and it is such moderate sizes which are of special interest to the mine and plant operator of the West, of Mexico, of Africa, and of other places where fuel is expensive. A number of power plants consisting of several such engines are in use. The plant at Santa Barbara, Chihuahua, was at first operated on imported coal of various grades. Finally it was found that native fuel was suitable, and at times the plant has even operated on wood-gas exclusively. The same may be said of the gas engines at Nacozari, in Sonora. At the Waihi G. M. Co.'s plant in New Zealand, five gas engines of moderate capacity (200-hp.), operating on producer-gas have been placed in the Waikino mill, besides numerous smaller engines, and a pumping-plant, including two 370-hp. engines, has been ordered.

It should be noted as an important consideration in the decision as to the suitability of gas engines for any particular work, that on account of the necessity for cleaning the electrodes and cylinders at intervals, it is better policy to divide the power-load between several engines, rather than to be obliged to shut down the plant for this necessary cleaning, unless there are regular stoppages for other purposes. As such units can be obtained in any desired size up to many thousand horse-power, the question of relative cost is alone involved.

For the mining power plant, a gas producer is a necessary part. The producer is now made so simple, effective and automatic that the troubles which the

gas engineer experienced in the past have been practically eliminated. For the smaller sizes, suction producers are reliable and less expensive. For the larger sizes the pressure producer is favored. The choice is largely a matter of local conditions, a fact occasionally proven in a most practical manner. For example, the blowing section of a producer in a plant containing several 2000-hp. engines was put out of commission for several hours by a careless employee. Until the necessary repairs were made the gas plant delivered its product to the engines as a suction producer, with no ill effects or difficulty.

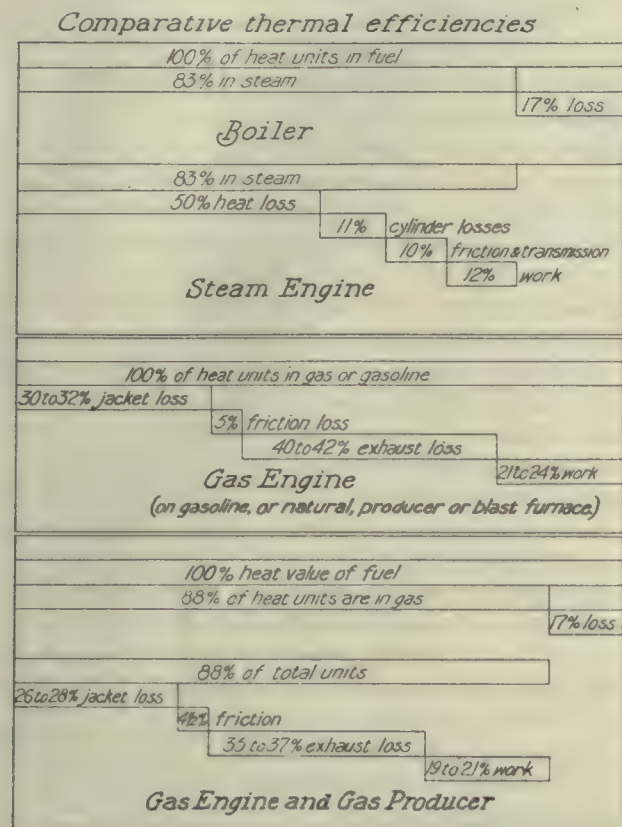
Although in the majority of cases in the East, coal or coke is used in the producer, plants of 100-hp. and over are running in many parts of the world using wood as fuel. A bed of incandescent coke is maintained in the bottom of the producer as a final 'fixer' of the tarry products distilled from the wood. The simplest form of suction gas producer (in which the gas is taken from the top of the fire and is, therefore, not obliged to pass through an incandescent bed), must be fed with fuel which produces no considerable amount of tarry or other condensable gas.

In Europe it is customary to grade coal for producers between $\frac{1}{2}$ and $1\frac{1}{2}$ in. in size, which adds somewhat to the cost of the fuel. Where charcoal is used in small plants it is best to seive out the fine coal and dirt, in this way reducing the dust taken up by the gas, as well as the amount of clinker and ash. In addition, the fire burns more nearly evenly, and for a longer time without cleaning. A suction producer and engine of 115-hp. is operating in South Africa, 130 miles from the railway. The fuel is charcoal and 1-hp. per hour is regularly developed with from 1 to 1.25 lb. of fuel. The engine runs a rock-breaker, crushing-rolls, elevators, screens, jigs, Wilfleys, pumps, etc., for a copper concentrator and its regulation is reported to be perfectly satisfactory.

The general design of the Gary engines can only be lightly touched upon here. The most striking feature is the massive frame. This frame alone weighs 100 tons, and the factor of safety used in the design of the strain-resisting parts is so large that the normal load is but a small part of the total strength of the machine. Although the shaft of the direct connected engines, which must carry the weight of the revolving field of the alternator, is 3 ft. in diameter, the lower shell of the main bearing is provided with a spherical seat to allow for deflection of the shaft. The deflection of the piston-rod under the weight of the huge piston is met by giving the rod a slight initial camber. All surfaces exposed to the ignited charge such as cylinder walls and heads, piston, piston-rod and exhaust-valve, as well as the lower shells of the main bearings, are water-cooled. The valve arrangement is simple with the inlet valve on top and the discharge below. The timing of the air and gas valve is such that sufficient air is first admitted to clear the cylinder, then gas and air follow, and finally the gas valve closes first, thus permitting a layer of air to lie between the explosive charge in the cylinder and the inlet valve. Two independent electrically operated igniters are fitted into each cylinder near the heads. The timing of these is taken care of by sets of brushes bearing on make

and break collector rings mounted on the eccentric shaft, and regulated by a single hand wheel.

The Western lignite, owing to difficulties in firing it successfully, is not suitable for use under boilers,



but is entirely satisfactory in producers designed for its use. One horse-power can be delivered from two pounds of such fuel when it is used in a gas producer and gas engine. In fact, the manufacturers of producers are now successfully gasifying practically all

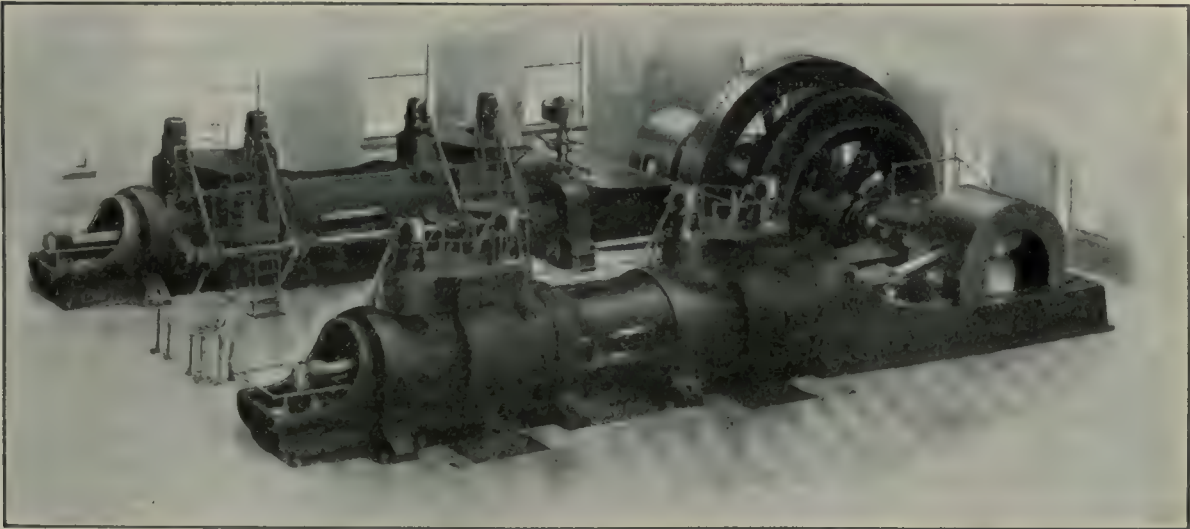
plant (per 24 hours and based on 3% charge), is 275-hp. At this rate the possible development of power at the various copper smelting plants in the United States, which operate under similar conditions, can be readily estimated.

All over the West occur opportunities for large saving in fuel cost and as the gas engine has now passed the experimental or uncertain stage in its development, there is no good excuse for failure to use it extensively. The manufacturers will now supply the engines and alternators and guarantee results, which is all that the steam engine manufacturer can do, and in fact, is all that he is asked to do.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

- T. L. C.: Dark gray basaltic rock.
- H. J. M., Crown King, Arizona: Hornblende-diorite.
- W. H. G., Eureka, California: The black crystals are hornblende.
- J. B., Stanley, Arizona: Porphyrite containing minute metallic grains.
- W. B. H., San Francisco, California: No. 1, dark gray barite; No. 2, earthy limonite.
- E. K. C., Georgetown, Colorado: Copper-antimony sulphide, tetrahedrite containing silver and granular quartz.
- V. C. J., Chihuahua, Mexico: No. 1, white calcite; No. 2, brown calcite; No. 3, gray granular limestone; No. 4, gray limestone.



Allis-Chalmers Four-Cycle, Double Acting Twin Tandem Gas Engine.

grades of bituminous coal, including slack and bone. No details have been published covering the operation in America of gas engines on copper blast-furnace gas, though such operation is being successfully carried out abroad. At Mansfield (quoting from Robert Schorr), the gas from the copper blast-furnaces has a heat value of 65 to 70 B. T. U. per cu. ft. The power equivalent for a ton of copper at that

- W. J. L., Asientos, Mexico: No. 1, seprentinized metamorphic rock with pyrite; No. 2, similar to No. 1, metarhyolite or metandesite.
- C. D., Easton, Washington: No. 1, white quartz thickly sprinkled with pyrite; No. 2, porous mass of limonite; No. 3, decomposed micaceous rock with much limonite; No. 4, mica-schist with quartz crystals.

APPLICATION OF STEEL TO MINE TIMBERING.

By R. B. WOODWORTH.

*The use of steel for the construction of tipples, smelting houses, boiler houses, and the like, in above-ground construction, is not new. It came into use early in the history of extensive mining operations in the United States. The use of steel in constructions of this character is subject to well-known laws such as obtain in the design and use of mill-buildings, boiler plants, and other structures. There are special considerations in connection with the use of steel underground for gangway supports, pump stations, and so forth, where temperature-conditions are different and where the loads to be carried must be investigated in the light of experience rather than from determinable principles of engineering design.

The first use of steel for the support of roofs in mining operations, of which I am aware, was in 1878, when it was attempted to use old rails as head-pieces in the mines of Commentry, France. The best results were obtained when they were placed edge-ways, but they were liable to breakage. Iron bars of rectangular section 3.15 by 1.18 in. by 12 ft. long were ultimately adopted in preference to rails and other sections, as they are easily straightened, and great rigidity is not necessary. In 1889 some of the bars had been re-used 200 times. Breakages were rare, as iron or steel bends under stress before it breaks. The roof in this mine was probably of first-class character, otherwise, owing to the weakness of the form of section employed, the sections in use would not have given the satisfaction which they seem to have rendered. Previous to 1884 old iron and steel rails had been used at the Thorncliffe collieries in England, but about 1884, according to *The Journal of the Iron and Steel Institute* for 1887, I-beams of mild steel were installed in these collieries for props and roof-supports, and their behavior is noted with great satisfaction. At these collieries it was difficult and expensive to maintain a gang-way with wood, and it was noted that the steel-beams proved to be much better than iron or steel rails. They did not break as often but would bend 9 in. in the centre of an 8-ft. span without showing signs of fracture. "So far, out of some thousands in use, only nine have broken; of these, five were 10 ft. long by 6 in. deep, and broke without much deflection; one was 9 ft. long and 5 in. deep and broke with a deflection of 6 in; the remaining three were each 8 ft. 6 in. long and 5 in. deep, and were considerably bent before breaking." This experience is in line with sound engineering principles which demonstrate conclusively that for roof-supports the I-beam is the ideal form of section. In 1888 iron and steel frames had been installed in the Creusot mines in France, the Prussian Government lead mines in the Harz mountains, the Altenwald coal mine near Saarbruecken, Prussia, and the Segur mines in Austria, and since that date the use of steel in the English and Continental mines has had a continual and satisfactory development. The advantages in their use as compared with wood,

apart from considerations of fire protection, were their greater durability, the possibility of re-use, lightness and handiness, increased space for ventilation, and less deterioration of the air of the mine from decaying timber.

The earliest use of steel in the mines of the United States for roof and gangway supports followed the lines of previous history on the Continent; that is to say, worn-out steel rails were used, to be followed in turn by steel beams supported on masonry, or on solid coal, or on timber supports embedded in the coal. The Carnegie Steel Co., in 1894, made designs for the substitution of steel in place of wood in the lighter operations, but the first use of square timber-sets of structural shapes for main headings seems to have been in 1897 at Stearns' shaft, Susquehanna Coal Co., Nanticoke, Pennsylvania, under the supervision of R. V. Norris, consulting engineer. These timbers were put in 540 ft. below the surface, and the conditions which caused their use were the large spans at the foot of the shaft and the great pressure under which 24 in. yellow pine timber collars lasted only about 8 months. This steel is still in position, and in excellent condition, exposed to constant contact with mine-water, without signs of failure or corrosion, and without other protection than good heavy coats of paint.

About 1897 the Lehigh Valley Coal Co. also installed at the Hazleton shaft colliery, No. 40 slope, under the supervision of S. D. Warriner, chief engineer, and W. A. Lathrop, general manager, a pump-house framed with square timber-sets composed of 12 in. 35 lb. beams, connected by castings, and lagged with old rails. This pump-house is 51 ft. 3 in. long by 24 ft. 5 in. wide, and shelters a Corliss cross-compound surface-condensing pumping-engine of 35,000 gal. capacity per minute, under a steam pressure of 100 lb. per sq. in. and 550 ft. vertical head. The pump-house is in the bottom rock of the Wharton vein, 1085 ft. above sea level. Since 1897 the success which has attended the installation of steel gangway supports has led to a gradual increase in the number of installations, and in the last two or three years more rapid progress has been made by reason of the introduction of forms particularly adapted for use as legs of the square timber-sets, props, and the like. As already noted, early experience indicated that the standard I-beam was the section best adapted for collars and for roof-supports generally, as this form of section combines a high degree of resistance to bending, with a minimum of material. It is not, however, suitable for use as the legs of the square timber-sets, or as isolated props, by reason of the fact that the radius of gyration of the section is low, and it is not, therefore, adapted to resist compressive strains, to sustain which a shape is needed equally strong about both axes of symmetry. Hollow tubes possess these requirements in a theoretically ideal manner, but suffer from the disadvantages of relatively high cost, and the difficulty of making proper connections, which have practically prohibited their use in building constructions above-ground except those of the simplest character. For the legs of the square timber-sets, and for the isolated mine-props, the ideal

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rolled section of sufficient strength for most ordinary conditions is given us in the H-section, a form of rolled shape which possesses a large radius of gyration, and the most economical distribution of material in comparison to its weight. The first manufacturer to furnish these in the United States was the Carnegie Steel Co., and its 4, 5, 6, and 8 in. sections have been designed as the result of careful investigation into mining conditions with an especial view to use in mining operations. The 4 in. section, first rolled November 11, 1907, weighed 13.6 lb. per lineal foot, and is equivalent in strength to an 8 in. yellow pine timber; the 5 in. section, weighing 18.7 lb., first rolled December 4, 1907, the 6 in., weighing 23.8 lb., first rolled August 23, 1907, and the 8 in. section, weighing 34.6 lb., are equivalent in strength to 10, 12, and 15 in. round southern yellow pine timbers. Experience in their use has demonstrated that it will seldom be necessary to go beyond this range of sizes.

As already noted, steel was first used for roof-supports in the form of rails, to be followed by rectangular bars, and finally by the standard I-beam supported on the coal, or on the rock, or on short wooden posts, or, as is quite common in the permanent gangways of the English mines, on long walls built from waste rock or brick. An example of this latter form of construction is to be found also in the Leggitts creek colliery, Delaware & Hudson Co., Scranton, Pennsylvania. This is the simplest use to which steel can be put in the mines, and noteworthy examples are to be found in the bituminous fields of southeastern Ohio. At the Boggs mine, of the Youghiogeny & Ohio Coal Co.'s No. 3 mine, at Barton, Ohio, a similar installation is in place on an entry 16 ft. wide, in most cases 6 in. beams being used, and taking the place of 10 by 12 in. timbers, the average life of which is only one and a half to two years. At drift No. 1, Roby Coal Co., Adena, Ohio, steel is being used to form a permanent gangway 9000 ft. long, the construction being similar to that followed in the mines of the Youghiogeny & Ohio Coal Co. In cases where the coal is good and solid, and not liable to crush, this simplest form of construction finds ready use, places of unusual weakness being taken care of by short timber-posts supported on props of longer or shorter lengths as conditions may require to obtain solid bearing. It may be said that there is a divergence of opinion as to the propriety of supporting beams directly on the solid coal, and in some States that form of construction is not acceptable to the mine inspectors. At all events great care should be exercised not to permit any excessive loads to come on the coal.

The next simplest form for the use of steel for gangway-supports is to be found in an installation made at the Adrian mines of the Rochester & Pittsburgh Coal & Iron Co., Punxsutawney, Pennsylvania, where 50 tons of 4 in. H-sections 13.6 lb. per foot, are used to replace wooden timbers 8 in. square. These H-sections are spaced 4 to 5 ft. centres and are supported at their ends on round timber-posts, making a very solid and substantial construction. In this mine the question of head-room was of prime consideration, and the additional 4 in. gained by the use of steel was an item of the utmost importance. The

4 in. H-sections used in this mine were the first of this size rolled in the United States.

In the form of construction originally designed by R. V. Norris for the Stearns shaft, Susquehanna Coal Co., Nanticoke, Pennsylvania, the collar is composed of a standard I-beam which frames at each end between two channels separated by gas pipe separators and resting at their bases on a cast-iron shoe of circular form which in turn fits into a cast-iron base. Pin connections are used at the top of the legs, one passing through the beam and channels and the other through the channels only; steel wedges are driven under the collar so as to distribute the weight on both pins. In this form of construction, for a standard single-track gangway, it is necessary to assemble 31 pieces; in ordinary practice these are bought from the different makers and the cost of this form of timber is comparatively high. An installation of this character, however, can be adapted to almost any requirement of strength and the largest stretches of steel timber gangway work in the anthracite regions are timbered after Mr. Norris' design. The Summit Branch Mining Co., for example, has a single stretch of 1500 ft. at its Williamstown, Pennsylvania, colliery, while other long stretches are to be found in the mines of the Lytle Coal Co., Minersville, Pennsylvania, Lykens Valley Coal Co., Williamstown, Pennsylvania, and the Windber mine No. 36, Berwind-White Coal Mining Co., Windber, Pennsylvania. In the latter installation the collars are 12 in. beams 12 ft. long; the legs are composed each of two 8 in. channels and the cotter-pins are $1\frac{3}{4}$ in. diam. The cast-iron bases rest on brick piers 18 in. square, and the lagging is composed in part of 30 lb. rails and in part of timber. The plain material was bought from the rolling mill and the fabrication was done in the shops of the Berwind-White Coal Mining Co. Observation and experience, however, indicate that inasmuch as wood gangway-supports used in square timbering are not adjustable, it is needless and uneconomical to provide adjustability in steel mine timbers, consequently different designs have been worked out by which the use of rocker-castings at the bottom and pin-connections at the top have been eliminated. Sets have been constructed of various modifications between these limits, the simplest form in which the double channel-leg can be used in combination with an I-beam collar, in which the two channels forming the legs are connected in the shop by bolts and separators. They carry angle-brackets at their tops, on which the beam rests, and to which it is connected by bolts to permit easy removal, and they rest at their bottoms on steel-plates to which bars are riveted forming slots for holding the channels in position. In this form of construction, when the material reaches the point of erection there are only five pieces to take care of; the single beam-collar, the two legs, and two base-plates. If the footing is good, even the base-plates can be eliminated. The angles riveted to the webs of the channels transmit the load from the collars to the legs, and the bent angle-brackets prevent undue side motion.

In the large majority of cases and up to the limit of their strength the H-sections will be found the ideal form for simplicity and economical construc-

tion. The simplest form adapted for square timber purposes consists of a beam-collar, two H-section legs with lug-angles at the top to prevent side-motion, and absolutely plain plates for bearings. If the plain plates are omitted, there are practically three pieces to handle. The set can be put together on the ground, and raised into position with a minimum of difficulty and in this form the steel square timber-set is the exact equivalent of the three-piece wooden set in such common use. The first sets of this design used in the United States were installed in October, 1907, in the pump-house of the Midvalley Coal Co., at Wilburton, Pennsylvania, and the steady demand for them indicates their perfect adaptation for the usual purposes of timbering gangways. Examples of their use are now to be found in the mines of the Lytle Coal Co., Summit Branch Mining Co., Berwind-White Coal Mining Co., Alden Coal Co., Susquehanna Coal Co., Pine Hill Coal Co., and the Greenough Red Ash Coal Co. The bent lug-angle which prevents lateral motion may be replaced by a steel bar, and sets of this character may be found, among other places, in the Maxwell colliery of the Lehigh & Wilkes-Barre Coal Co. In fact the ease with which steel can be adapted to any condition of service is exemplified in the various simple modifications which have been made in the construction of mine-timbers.

In the endeavor to obtain adjustability in a simple way a steel gangway support has been devised in which a set consists of an I-beam collar and H-section legs connected to each other by rocker-castings, and resting at the bottom on a casting exactly similar to that at the top, allowing free motion both at the top and the bottom. There will be few cases, however, where it is necessary or desirable to go to this refinement in ordinary mine-construction. An example of its use, however, is to be found in the mines of the Copper Queen Consolidated Mining Co., at Bisbee, Arizona, 60 sets being installed in 1908. Examples are also to be found in the mines of the Delaware, Lackawana & Western Railroad at Scranton, Pennsylvania.

The forms of lagging for use with square timber sets vary, of course, with conditions in the mines and the materials readily at hand. In some cases short round poles are used, in other cases planks $1\frac{1}{2}$ to 2 in. thick which have served their period of usefulness outside, and in other cases old rails. An excellent installation consists in the use of concrete arches of slight depth, sprung in between the gangway timbers. Endeavors have also been made to lag with thin slabs of concrete made on wire netting, expanded metal, and other forms common in building construction. The most complete and modern installation, however, is to be seen in the pump-house at No. 5 mine, Pennsylvania Coal & Coke Co., Ehrenfeld, Cambria county, Pennsylvania. This pump-house is 36 ft. long, 19 wide and 13 high in the clear of roof-support collars. The framing is built up from 11 sets of mine timbers with 6 in. H-section legs and 6 in. H-section collars. The collar is supported in the middle by a 20 in. 65 lb. I-beam, which carries the trolley for handling all machinery, and rests on three 6 in. 23.8 lb. H-section posts at centre

and ends. The legs rest on concrete bases; between the legs and the collars are framed short lengths of 6 in. 12.25 lb. beams, and between the legs and the collars are framed short lengths of 6 in. 12.25 lb. beams, and the whole structure is covered completely by $\frac{3}{8}$ in. steel plates. These plates are cut to short lengths for easy assembling and are held in position by $\frac{5}{8}$ in. bolts. No wood being used in the construction of any portion of the pump-house, the structure is absolutely fireproof.

So far as isolated mine-props are concerned, I have been unable to learn of the use of steel in the United States, and would be glad to obtain detailed information on this application of steel to mine timbering. Timber conditions in the United States are such that it has been possible heretofore to obtain prop-timber in sufficient sizes and quantity for all practical purposes. In the English mines, however, forms of steel-beams approximating the H-section have come into extended use. In 1905, for example, the Sandwell Park colliery, West Brownwich, England, was using 5 by 4 in. beams with $\frac{1}{2}$ in. webs weighing 22 lb. per foot in lengths up to about 7 ft. for prop-purposes and 6 by $4\frac{1}{2}$ in. beams with $\frac{1}{2}$ in. webs weighing 26 lb. per ft. for roof-supports. At the Bargood colliery of the Powell-Duffryn Co. the props were made by cutting out the webs of the beams at each end for 3 or 4 in. back and bending the flanges over so as to form a bearing for the steel. This construction gave fair satisfaction, but suffers from excessive cost in manufacture. At other collieries the Mannesman Tube Co.'s system of collapsible tubes was in use. These tubes are made in two parts, the top section fitting inside the bottom, and are held in place by set-screws and other devices, giving a strength up to 16 tons direct compression. Many devices have also been patented in the United States to accomplish the same purpose, most of which, however, are based on ideas involving large expense, and all departing from that simplicity which is found in the use of wood. The forms of mechanical prop used in German mines are made in a collapsible form, and the cost is practically prohibitive so far as American conditions are concerned. It does not seem to be necessary to provide much variation in the length of props, and the simplest and cheapest form in steel which can be devised under present mining conditions is an H-section cut to length resting on a $\frac{1}{4}$ or $\frac{3}{8}$ -in. plate on the floor, and having a similar cap wedged against the roof by wooden wedges, or the H-section may bear against wooden blocks at each end.

So far as I am able to ascertain there are no well-defined rules by which the strength of square timber-sets or props may be calculated, and conditions in the mines vary so much that no set rules can be laid down. Experience governs the use of wooden mine-timbers in such conditions as timbering is required, and experience in the use of steel must necessarily follow experience in the use of wood. Tables of equivalent strength of wood and steel beams, columns, and so forth, enable the designer readily to substitute steel for wood in existing operations. In new operations the design must follow observed conditions elsewhere, but at all events the variety of

sizes and weights rolled by the steel makers is sufficient to permit a close approximation to the strength desired, so that there may be absolutely no waste of material. There is this difference between the behavior of steel and wood under service-conditions: steel deflects gradually under pressure, and will bend greatly before breaking; indeed unless there are defects in the steel itself, there is no reason at all why a steel-beam should break under any conceivable load in the mine, whereas wood, in addition to the pulling apart of the fibres longitudinally, will also break transversely. As a consequence of this difference in the behavior of the material, wood, which has been in place and is overstrained, is worthless; the steel which has deflected so far as to decrease the head-room in the roof-supports below the clearance-lines may be taken out, straightened, and replaced. Some of the bars in the Commentry mines, France, have been used 200 times. Another item of consideration is the fact that under temperature and moisture-conditions wood rapidly deteriorates, while steel remains unchanged, except so far as it may be liable to the ordinary processes of corrosion.

A pound of steel in beam-shape is, roughly speaking, equivalent in strength to a board-measure foot of the best southern yellow pine or white oak, and under present market conditions the cost of steel in Pennsylvania is about twice the cost of the wood used in square timber-sets, so that if the first cost of the installation is considered, the advantage will lie with the wood. Where, however, the gangway has to be maintained over a number of years, and the workings are in any sense permanent, the steel is economical on the basis of ultimate cost by reason of its long life and endurance. In the Maxwell colliery of the Lehigh & Wilkes-Barre Coal Co. double-track gangway-sets, consisting of 24-in round yellow pine collars 17 ft. long, with legs 10 ft. 6 in. long, weighing approximately 6280 lb., needed replacement in 2½ years. The cost of the timber-set was about \$10 for the timber, or \$15 erected. These sets were replaced in 1908 by 20-in. 65-lb. beam-collars and 8-in. 34.6-lb. H-section legs. The cost per set erected on concrete bases was \$40. At the lowest assumption the steel should last 15 years, whereas during the same length of time six wooden sets would be required. Capitalized at 8% compound interest, at the end of 15 years the cost of the steel-set will represent an investment of \$95.86, while the six wooden sets would stand on the books at \$153.56. The steel when replaced, at the regular market price for scrap will be worth \$12.03, while the value of the wood will be nil. On this basis the saving on the steel can be put down at \$69.73 per set, which means a saving per set per year of \$4.63. The tendency in the price of timber, however, is constantly upward, whereas the price of steel should remain fairly uniform, so that year by year the economy in the use of the steel should increase.

In the long run true economy is not so much a consideration of first cost as a question of life and durability. The large use of steel in American mines has been so recent that only problematical figures can be given for its durability. The assumption made above of a life of fifteen years is believed to be exceed-

ingly conservative, for the reason, in the first place, that steel mine-timbers exposed to temperature and moisture conditions have been in use in the Stearns shaft of the Susquehanna Coal Co. since 1897, and in the second place because English practice has given us records extending over a much longer period. The average life of steel-props in Warwickshire is said to vary from 10 to 13 years, as compared with three months for timber including in this estimate the time for re-setting the timber and its ultimate use for sprags and lids, so that by the use of steel-props a saving of one penny per ton of coal mined has been effected. The life of steel for props in all likelihood would be much shorter than the length of its service in square timber-sets, owing to the more severe handling the former experiences in removal and re-setting, so that it may be assumed as reasonable to expect steel square timber-sets to last as long as required in any one mine, however large the property may be, and however long it is necessary to maintain the gangway. This saving of 2c. per ton would mean, under present mining conditions, a reduction of timber-cost from 7.7 to 5.7c. per ton in the anthracite region, and is in itself an item for careful consideration. The life of the square timber-sets at the Maxwell colliery of the Lehigh & Wilkes-Barre Coal Co., above referred to, is considerably longer than the average in the anthracite region, where the workings are deep and the moisture-conditions deleterious to wood, and as a general rule it may be laid down that the longest possible calculation of the life of steel and the highest possible duration of wood, due to peeling, seasoning, and preservative treatment, steel is truly economical when its first cost can be kept down to three or four times the price of the timber it displaces.

By the substitution of steel for wood in this particular instance 4 in. of head-room was gained and 32 in. in width; that is to say, had the steel been used for wood in the first place, the excavation could have been made 4 in. lower and 32 in. narrower, which is quite a large item where the headings are driven partly or entirely through rock. In the installation at the Adrian mines of the Rochester & Pittsburg Coal & Iron Co., above referred to, the 4-in. beams took the place of 8-in. timbers, resulting in the saving of 4 in. of head-room, and as a general proposition this item is worthy of consideration in connection with the first cost of installation. The presence of decaying timbers in the mine is quite a large factor in the deterioration of the air and the consequent comfort and healthfulness of the operations, and is a large agent in the extension of deterioration to other timbers. It is plainly apparent that anything which will tend to improve atmospheric conditions will be steps in the direction of true economy, and such aid is to be found in the use of steel.

Inasmuch as all the timber for underground work has to be handled down the shafts or over the tracks, the reduction in weight to be handled effected by the use of steel is an item of large importance leading to cheapness in erection, and therefore to reduction in first cost of the installation. The wooden timber-sets for the Lehigh & Wilkes-Barre Coal Co.

required the handling in erection of 126 cu. ft. of wood, weighing approximately 6280 lb., whereas the steel weighed approximately 1690 lb. per set, without the base-plates; the saving in freight and cost of erection is apparent. With the steel there is no handling of excess material, as it is furnished by the manufacturers ready to assemble at the mines without waste. The wood, however, has to be framed, with a consequent loss in time and waste in material. A number of square timber-sets, at the Allport mines at Barnesboro, Pennsylvania, were handled by three men without difficulty, and erected in 15 minutes. No skilled labor is required, as in outside building work, the installation being conducted by the ordinary workmen. In this particular installation the sets weighed about 372 lb. each, complete, and were lagged in place by 2-in. plank. The ease of erection was so great, and the cost so small, as to be a surprise to the mine-owner. As a general proposition, the cost of erection of steel mine-timbers should not exceed 30% of the cost of wood of equivalent strength, allowance being made for waste and excess weight.

Another advantage of steel as compared with wood, of large importance, is its fireproof character, and if there were no other reasons for using steel in the mines, at least at pump-houses and at the foot of shafts, steel mine-timbers are to be recommended for commercial and humanitarian reasons, as its use in the situations exposed to fire will obviate to a large extent the destruction of life and property. Statistics of destructive fires in mines are not available, but at the Avondale shaft, Avondale, Pennsylvania, in the early sixties, occurred one of the disastrous mine accidents in the anthracite region which entailed the loss of the lives of about 100 persons, and which shut down operations for a considerable period. At one of the Shamokin mines within the past four years fire started in the dry timbers of the pump-house which resulted in the shutting down of the colliery for about four months with a loss to the coal company of the profit on 160,000 tons of coal. In the same vicinity, about the same time, a fire occurred which caused the loss of several lives, the shutting down of the mines for over two years, and the loss of profit to the mining and transportation companies on over 700,000 tons of coal. The use of steel, of course, will not prevent fires from gas explosions, but it has already demonstrated its usefulness in mines where explosions and fires have occurred, as, for example, at the Courrieres mines in France, and though it is possible to displace steel and to bend it so as to require re-straightening, it cannot catch fire. If stables, pump-houses, and the foot of slopes and shafts, were properly timbered in steel, the fire-risks in mining operations would be cut down to causes in a large measure not subject to human control. Another advantage in the use of steel as compared with wood which has especial reference to isolated props is the matter of re-use. Under present conditions the props are seldom withdrawn, and are usually utterly worthless when the time comes for their replacement. The timber in wooden gangway-supports likewise suffers from the same deterioration. Steel, however, will stand severe punish-

ment. As already narrated, in English mines roof-supports have been taken out, turned and used 200 times over, and the experience is fully corroborated by such use as has been made of steel in the United States. It is seldom that steel gangway-supports need to be removed, as they are usually put in permanent workings; at the same time the details are so simple as to offer no difficulties in the way of such removal and re-use, and even when the steel has served its purpose, and under heavy loads which taxed it beyond its strength, it has been so crippled and twisted as to be no longer safe for mine operations, it still possesses a relatively high value for sale as heavy melting-stock.

My experience in the use of steel mine-timbers has been confined to the anthracite and bituminous coal mines of Pennsylvania and Ohio. I have mentioned in passing an installation in the mines of the Copper Queen Consolidated Mining Co. at Bisbee, Arizona, where certain sections were put in a year ago. Recent reports from this seem to indicate that these sets, which were installed as an experiment, were found to be impracticable in swelling ground. A number of these were placed in only moderately heavy ground, and most of them are standing well. These are in drifts in which timbers rotted very quickly, and they used generally the 5 and the 4-in. H-sections which took a permanent-set after some length of time. Later the heavier sections were tried in a part of the mine which was extremely heavy, but which it was necessary to keep open, where 12 by 12-in. Oregon pine timbers crushed in about a month or less. At this point the Copper Queen used some sets of 6-in. H-section collars and posts, and a few other sets of 6-in. H-section collars and posts formed of 8-in. channels, pinned and bolted together. In this heavy ground they failed in about the same time as the timber, the posts bending out of shape and crippling badly. The double channel-legs were not so satisfactory as the H-section legs, and several H-section collars were crushed at the ends to about one-half the original height. This seems to indicate that the sets in question were too light for the service contemplated. As already noted, in the use of mine-timbers experience must be the guide in the absence of well-defined and accurate knowledge on which true engineering design may be based, and the comparative failure of the few sets under extraordinary conditions where results demonstrated that the sets in question were too light for the service, cannot be considered as an objection to the use of an article, the excellent character of which has been amply demonstrated in other situations.

In the iron mining districts there has been an ever-increasing use of steel for lining shafts, and excellent installations in which the new H-sections are used are to be found in the mines of the Newport Mining Co., together with large uses of steel of standard structural beams, angles, and rails, in the mines of the Oliver Iron Mining Co.

A company operating under the name of the Cia. Mexicana de Acero Productos Químicos, S. A., has entered into a contract with the Mexican Government for the manufacture of calcium carbide and other chemical products.

PARALYSIS OF MINING DISTRICTS.

By EDMUND B. KIRBY.

***The Mining Boom.**—The young man, who for the first time follows a mining rush to the point of some new discovery, sees an interesting and, to him, a strange phenomenon. Men by dozens, then hundreds, then thousands, are hurrying to the spot, followed by supplies of every kind. Ore is accumulating on dumps, or moving out on road or trail. Around the lucky discovery, as a centre, is a busy scene, the ever widening area of active claims, driving shafts and tunnels into the ground, searching for ore. Beyond them are the miles of claims staked by later comers. As each new point of discovery is announced, an outlying camp springs into existence. Buildings and towns appear as if by magic. At the focal point men swarm, and money pours in from every part of the country. Trading progresses night and day; the buying and selling of claims; the capitalization of hopes and chances into stock issues and the sale of these to an excited country which uses them as chips in the great game of the stock exchanges. Fortunes are made on every hand; a few out of ore, but the majority out of other people. The game is wild, boldly played, and with big stakes.

He comes a few years later, and the scene has changed to an industrial one. The few fortunate mines are digging, shipping, milling, and smelting. Their employees and the merchants who supply their wants are prosperous, but with pay-roll prosperity. All others have disappeared. The day of fortunes has gone. Around the industrial centre is a scene of desolation and waste. Digging there has ceased and the surrounding hills have become a cemetery. In every direction appear decaying head-frames and mine buildings, and the scars of innumerable excavations, each one marking the grave of some buried hope. The swarming town has shrunk to a factory village. In the outlying camps is the silence of industrial death. Then the years roll on, and as the discovered ore becomes exhausted, one by one the great mines stop, and the desert, calmly waiting, resumes its ancient sway.

And, after the man has seen other booms, and has learned of mining in other lands, and other times, he awakens at last to the fact that the life-process he has been noting is the same for every district, differing only in its length, or in details, which depend upon the country and the character of the discoveries. But, what is the reason for such a process? What is it that so quickly stops exploration? What is that strange paralysis which appears so promptly at the extremities of the district, and presses so steadily and resistlessly toward its centre? To such questions, the inquirer receives from mining men the ready answers: Perfectly natural! Necessary reaction! No ore! Dug out! Game over! Everybody gone home! But, suppose he has a brain which thinks, which is not put to sleep by ready-made answers, but wants to know: Why is paralysis natural? Why did the digging for ore stop so suddenly and

simultaneously, and why does it stay stopped? Was all the ore in this great area discovered in that brief spurt? Were those holes the intelligent work of experienced miners, or the reckless attempts of ignorant speculators? Is the camp really dug out? Why did everybody have to go home? Are such questions any more foolish than those of the men who first asked: Is smallpox natural? Is diphtheria necessary?

Land Withdrawn from Use.—Investigate the paralyzed area and on nearly every claim we find that the owner, whether an individual or a corporation, has practically finished all the digging he is ever going to do there. His money has run out, or the chances on that claim are too poor, in his judgment, to warrant the risk of more; or, he has never intended to do any more than the 10-ft. discovery hole and the pretense of annual assessment work necessary to hold the claim; awaiting the development of the country; improvement of transportation; methods of treatment. The vast majority throughout the West and Alaska are of the latter class. Not 1% of idle claim-owners seriously intend to dig, or make active efforts to raise money for that purpose. All are waiting. Much of the dead area is owned by defunct mining companies. Their stocks are scattered over the country; their officers have vanished and any attempt to do business with one of these concerns is a task the difficulties of which can be appreciated only by those who have tried it.

Examine the work done on each claim and we find that in the great majority referred to, the trifling discovery and assessment work has been merely perfunctory, and has furnished little or no evidence as to the mineral chances of the ground. These are still unknown; they are as good or as bad as they were before. In the cases where some real digging has been done, it is often found misplaced, or so unwisely executed that it has not settled the question at issue. Hence, most of the area tied up is still untested; still capable of discoveries, great and small. It still needs the work of the prospector and the miner, but has been permanently locked up beyond their reach.

Extent of the Paralysis.—Analyze all the varied plans and motives of these idle claim-owners, and we find that most of them are waiting either in the hope of profiting in some way by the work of other men, or with the expectation that in the distant future, investors will pay prices which they now decline. The dead-lock thus produced is the deadly paralysis which curses the mining industry today. There is nothing to break it; nothing to force action. There are no expenses. The assessment work of \$100 annually for unpatented claims, is usually faked, and the taxes are nothing, or so trifling as to be merely nominal. Owners can wait forever, and they do wait generation after generation, hoping that some time, in some way, the worn title deeds, or faded stock certificates, will enable them to extract a fortune from other men. And so, a great industry languishes, while paralysis, partial or complete, blights every district from the Mexican line to the frontiers of Alaska; prospectors have no where to go, and miners lack work, while investors and the rep-

*Address delivered before the American Mining Congress, Goldfield, Nevada.

representatives of mining capital are searching this and other countries for opportunities to mine.

That the mining industry can move at all under this handicap, is proof of its vitality. It is always struggling, ever breaking through the spell into new life here and there. Nature is prodigal, and the desire to mine is strong. Men still pay the price and take a chance. Some camps are so rich that development discoveries have slowly grown and extended for many years, bringing to life again, for important periods, large portions of the dead margin. In others, the great mines have lasted for generations. Sometimes new discoveries, or improvements in methods of mining and reduction, have brought dead tracts to life again. But, over the greater part of the vast mineral area, paralysis reigns supreme. The industrial life appearing and re-appearing here and there is, at best, only a mere indication of its latent possibilities; of what the mining industry might be if the disease which now represses it was eradicated. Dug out! Why, mining in this country has only just begun!

Difficulty of Compelling Operation.—Now, idle claim-owners, whether large or small, are doing only what any other men would do in their places. They are operating within the rules of the game. So are the *bacilli* of tuberculosis or of typhoid. But, the disease which such ownership produces in the industrial system has always been evident to the perceptions of all men. The common sense of miners has always declared that rights to mineral, like rights to water, should exist only with use. To hold them otherwise, is an injury to all. In the freest and finest expression of that common sense, the old District Mining Laws of the West, made and enforced by the working miners, two intentions always appear; first, to prevent monopoly and give everyone a chance; second, to force every claim-owner to dig or to get off so that others may dig. The principle of the latter requirement still appears in the present United States law in its provisions for annual assessment work, the continuous operation of tunnels, and the like.

The history of mining law shows that men have always maintained a difference between the right to mineral and that to other forms of land. It was clearly seen that mineral is valuable only when discovered and mined, and that it is injurious to the State to permit such private ownership as will hold it out of use. For centuries past, mining laws have been saying that no man has the right to hold mineral land idle; that he must dig, or allow others to dig. The application of this principle was effective in small frontier camps where the miners who made the law stood on the ground to enforce it, but as it passed into general law covering vast areas and became dependent upon the cumbersome machinery of government for enforcement, it was found impossible to compel the continuous operation desired. Some codes were more effective than others, but even the old Mexican law, the finest product of accumulated experience, was only partly successful in this matter. The reason for this strange fact is simple. It seems easy to frame a law which will order a man, under penalty, to dig continuously, but

as a matter of fact this is so difficult that it never has and never can be accomplished. How much digging, how shall it be measured, and by whom? In what place and at what rate? How about delays from misfortune, delays to supplies? What single rule will fit the poor prospector and also the rich corporation? Who is to stand over half a million claims and see that the work is done? At whose say shall a man lose his property? By the time all these points have been provided for, they have so weakened the law as to make it ineffective, and all that it is capable of doing is to retard, more or less, the progress of paralysis.

As another remedy, a penalty-tax upon idle claims has often been proposed, but when the attempt is made to define the difference between idle and working claims, all the difficulties aforesaid at once appear, and it is evident that this plan has no possibility of success.

The New Remedy.—But, the world is progressing not only in electricity and aeronautics, but also in other branches of knowledge, and a new light has been thrown upon the problem which has so baffled past generations. It has been discovered that the way to force the use of any natural resource is to tax it, not lightly in the ordinary way, but heavily enough to make it uncomfortably expensive to hold without using. The holder is then impelled either to let go, or to utilize it in some way. Here, at last, is a new way to solve this old problem, a way to accomplish perfectly what the mining world has always been wanting and trying to do. It is the way to end promptly and forever the paralysis of mining districts. The old method was to give men orders which could not be enforced. The new method gives no orders. It lets every man do as he wills, but it applies to each man a new and subtle force, continuous, persistent, unevadable, the force of his own pocket, making him now want to dig, or get off the claim.

But the question may be raised; how can it help an industry to tax it? The answer is that the industry, the digging out of the mineral, is not taxed. Every man is made to pay for occupancy; for holding a reservation of mineral ground away from other people who want it. Such a payment, when made just large enough to be uncomfortable, or painful, on an idle claim, would be only a small item in the expense list of an operating claim, for it takes money to mine. Such an item would never stop, or discourage digging. In producing mines, it would be far less than the royalties now paid everywhere by miners to idle claim-owners. When a man has to pay for the privilege, he will not hold more ground than he intends to work. When the privilege of holding is free, he will naturally grab everything in sight and wait in order to hold up some one else who may want to use it. Let the dog in the manger pay for his manger.

Strange as it may seem at first sight, the way to boom an industry is to tax the natural resources it uses. The way to discourage it, is to tax anything else it uses, or to tax its products. This scientific principle of modern taxation is now as firmly established as any law of chemistry or physics, and is

slowly but steadily, forcing its way into the tax-systems of civilized countries. If you want to encourage the utilization of water-power, tax water-falls so heavily that no one can hold one idle, or away from would-be users, and only actual users can pay the tax. To discourage use, tax the buildings, machinery, supplies, or income. The best and the scientific method of applying the tax to claims would be by assessment according to their actual values. But any method will work, so long as it is carried far enough to produce the effect. It will, of course, be necessary to prevent tax-dodging. Any State, or any county, may apply the remedy at will, for even if there are limits to the tax-levy it may impose, there are none to its powers of assessment. It can apply the pressure and steadily increase it, watching the effect, until this has reached the point desired.

As a starter, which will serve to give partial relief promptly and generally, a certain improvement may be made in the United States assessment law. This is to change the present requirement of \$100 worth of assessment work per year on unpatented claims, into a cash payment of \$100. The object of this change would be to make a weak law more effective by converting it into a taxation scheme. At present, it is better than nothing, but still a failure, for the simple reason that there is no way to stand over hundreds of thousands of claim-owners and see that each one does his work, and that it is really worth \$100, and so this provision is evaded in various ways. The payment of \$100 in cash, however, would be clear and definite, and much harder to evade. Dodging may be prevented entirely by suitable provision in the law. This amount, acting as a tax, and made non-evadable, would set free for the prospector at least one-third of the claims now held in the United States and Alaska. The remaining work would have to be done by State and county taxation, and by Congress for Alaska. The present assessment law is all that is left of past efforts to make men dig or get off the claim, and it should not be altered, except for the deliberate purpose as aforesaid of converting it into a more effective instrument. It may be added that an incidental advantage of the improvement suggested is that the record of payments made will do away with many of the present title uncertainties now due to pretended assessment work.

Relief to Prospectors.—It will be argued that a tax of \$100, to say nothing of additional State and county taxes, would ruin the prospector. As a matter of fact, it will have exactly the opposite effect and nothing can be more to his benefit than measures which tend to check monopoly and force every one to dig, or get off the claim. Suppose he has to let go of his single claim? What has he made out of it? It has never yielded him anything but dreams. Are not hundreds of thousands of claims, just as good or better, now thrown open to him to prospect, or to hold when he pleases? It is simple arithmetic. Lose one and gain a hundred thousand, which is the better? Will not the surface of the earth once more be open to him to prospect as in the old days? Today it is shut off, staked and monumented as far as the

eye can see. He is like the Indian and the cow-puncher. His business is gone. The wonderful judgment and skill in finding ore deposits, gained by years of experience, are now useless. A few young and less experienced men may reach the unstaked frontier in Alaska, but he cannot. He asks despairingly, Where can I go? What can I do? So, he settles down upon some fourth-class chance, which the crowd of claim-stakers have passed by, or abandoned, and hangs grimly on to his last hope.

Let us look squarely at the facts. A very small percentage of the idle mineral claims are owned by prospectors. The overwhelming bulk is held by mining companies, or by individual investors, who have shut off the prospector and destroyed his business. In most cases, the few claims he is supposed to own, are, in reality, only part his. The investors who furnish his grub, own from a half to a three-quarter interest and the tax-money would, like other expenses, come from them. The prospector is virtually only their watchman or care-taker. The fact is that the prospector himself is not a success at the game of idle claims, and rarely makes it pay. His real business is not claim staking, or watching stakes, but the discovery of ore-deposits. Give him back his regular business, and his chances of making a fortune will be multiplied a hundred fold. The prospector does not have to be mollycoddled. He can stand any laws which are necessary for his own and the general good, and can raise tax-money, when wanted, in the same way that he now raises his expense money. Mining investors are always eager for opportunities and every prospector who makes a real discovery, worth holding, is promptly beset by men who crowd their money upon him. If the claim is not valuable enough to interest others, he will not hold it, and so will pay no tax. If it is desired to force large companies with areas of two, four, ten square miles of valuable mineral land to dig or get off the claim, the prospector must do likewise. A far more profitable business awaits him, and with the flood of prosperity which will follow more digging and free mineral land, he will never want a job or a grub stake, or financial backers and purchasers for his discoveries. Abolish the claim-staker and give the real prospector a chance once more, and you will hear of new discoveries from every quarter. Dig or get off the claim!

The question may present itself whether a tax of \$100 per claim, while applying the necessary pressure to ordinary claim-holders, will not be too small to be felt by mining companies. This would be true in many cases, but this tax is only suggested as a convenient and universal starter. The further pressure needed in such cases must be applied by State and county taxation. As a matter of fact, however, nothing is more sensitive than the pocket of a corporation, particularly if that corporation be idle, or the pocket empty. Even the tax of \$100 will have a wonderful effect in causing mining companies to trim their edges, and further pressure may be made to squeeze their holdings down to actual working needs.

Investors Attracted.—Another question which will be raised is whether the taxation of mining claims

would not interfere with property rights; destroy the value of investments; scare away investors. What rights? The right to hold a claim without using it? Don't you want to discourage that? Has not the mining world for centuries forbidden it and tried in every way it knew to prevent it? Investments in what? In idleness? In a hold-up of industry? Don't you want to destroy the value of such investments? Scare what investors? Those who want to dig; to do real mining; to build mills; smelters; railways; towns? On the contrary you will draw them in swarms, because when holders have to dig or get off the claim all who have claims worth mining, will make their offers for working capital attractive enough to get it.

What first excites and draws investors into mining ventures is the chance to find ore by actual digging. This is what they ask for. It is the chance of discovery, and not the acreage of a property which brings their money. At first they are not, as a rule, interested in the other game of waiting to hold up some future producer, and, in fact, do not even think of this, unless fortune turns against them and work comes to a stand-still. Then they naturally want all the chances for salvage that the rules permit, and paralysis ensues. Is it not right to say to these men: you have had a miner's chance, sorry your money is lost, but it is gone and there is no reason why you should take it out of some other man's pocket; these claims are worthless until ore is discovered and mined; the State wants this done, and will not let you paralyze its mining industry; if you are through digging, get off, so that some one else may dig? That is what the common sense of miners has always said. It is what the mining laws of the world have always said, but with a feeble voice. Is it not time to say it now with a loud voice and make it go? Dig, or get off the claim!

Advantages to Claim-holders.—Even idle holders themselves see that they have brought on a dead-lock which is not to their own advantage. Very few really make any money at it. Men grow old and sink into the grave, still dreaming of the purchaser who never comes. In the great majority of cases, all that holders will really lose by the proposed change in the rules, are their visions, their hallucinations. In exchange for these, there will be the countless opportunities of a rejuvenated industry. Is it not as clear as day that by the pressure of increasing taxation, every claim may be forced into use, or released? When from Mexico to Alaska every claim is either working, or open to prospectors, does it take a prophet to see the result? Does not every prospector know of areas he would like to explore? Does not every miner, every operator, know of places where he would like to dig? After the real mining industry begins, cannot every one foresee in its general, steady and permanent prosperity, a better living and more chances for a fortune than are possible under the present paralysis?

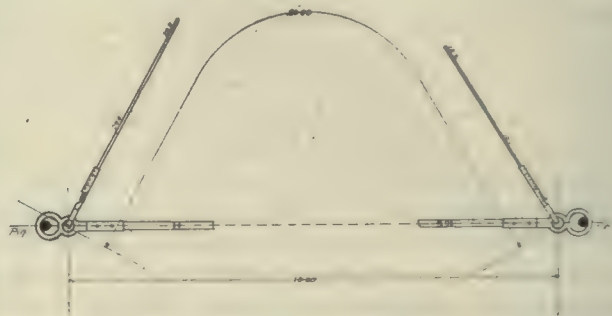
Men of the mining world, the new era awaits your call. You have but to say the magic words, Dig, or get off the claim!

Traction is directly proportional to the load, and inversely proportional to the diameter of the wheel.

DEFLECTING ANGLES WITH A 30-FT. TAPE.

Written for the MINING AND SCIENTIFIC PRESS
By LEE FRASER.

A 30-ft. length of tape is a convenient device for the measurement of deflection angles, when no greater accuracy is required than within 0°30' to 1°0'. Presuming that the slight amplification to the tape has been made, as indicated in the figure, reference to the accompanying table will disclose the proper distance to be taken on the tape for deflection angles from 0° to 90°. The operation of deflecting an angle consists in first stretching the 10-ft. base on the line from which the angle is to be turned, and securing it by pins as indicated. The remaining 20-ft. length of loose tape is now taken, at a distance from zero corresponding to the distance in feet in the table, opposite the angle it is desired to deflect, and upon stretching the tape, holding at the distance corresponding to the angle in the table, the required deflection is made. The values in the accompanying table were calculated from the equation of the ellipse for every five degrees, interpellations being made two times for the intermediate degrees. It was not found practicable to continue the computations for deflection-angles of greater magnitude than 90° on



| DEFLECTION ANGLES. | | | | | |
|--------------------|-------|----------|-------|----------|-------|
| Degrees. | Feet. | Degrees. | Feet. | Degrees. | Feet. |
| 0..... | 15.00 | 31..... | 16.89 | 61..... | 20.10 |
| 1..... | 15.01 | 32..... | 17.00 | 62..... | 20.21 |
| 2..... | 15.02 | 33..... | 17.10 | 63..... | 20.30 |
| 3..... | 15.04 | 34..... | 17.21 | 64..... | 20.40 |
| 4..... | 15.06 | 35..... | 17.33 | 65..... | 20.50 |
| 5..... | 15.08 | 36..... | 17.44 | 66..... | 20.60 |
| 6..... | 15.10 | 37..... | 17.55 | 67..... | 20.70 |
| 7..... | 15.13 | 38..... | 17.66 | 68..... | 20.80 |
| 8..... | 15.17 | 39..... | 17.77 | 69..... | 20.90 |
| 9..... | 15.21 | 40..... | 17.89 | 70..... | 21.00 |
| 10..... | 15.25 | 41..... | 18.00 | 71..... | 21.09 |
| 11..... | 15.30 | 42..... | 18.11 | 72..... | 21.18 |
| 12..... | 15.35 | 43..... | 18.22 | 73..... | 21.26 |
| 13..... | 15.41 | 44..... | 18.34 | 74..... | 21.34 |
| 14..... | 15.47 | 45..... | 18.46 | 75..... | 21.42 |
| 15..... | 15.54 | 46..... | 18.57 | 76..... | 21.50 |
| 16..... | 15.60 | 47..... | 18.68 | 77..... | 21.58 |
| 17..... | 15.69 | 48..... | 18.79 | 78..... | 21.65 |
| 18..... | 15.74 | 49..... | 18.89 | 79..... | 21.74 |
| 19..... | 15.81 | 50..... | 19.00 | 80..... | 21.00 |
| 20..... | 15.89 | 51..... | 19.10 | 81..... | 21.90 |
| 21..... | 15.97 | 52..... | 19.20 | 82..... | 21.97 |
| 22..... | 16.06 | 53..... | 19.30 | 83..... | 22.04 |
| 23..... | 16.15 | 54..... | 19.40 | 84..... | 22.10 |
| 24..... | 16.24 | 55..... | 19.50 | 85..... | 22.16 |
| 25..... | 16.33 | 56..... | 19.60 | 86..... | 22.22 |
| 26..... | 16.42 | 57..... | 19.70 | 87..... | 22.28 |
| 27..... | 16.51 | 58..... | 19.80 | 88..... | 22.35 |
| 28..... | 16.60 | 59..... | 19.90 | 89..... | 22.42 |
| 29..... | 16.70 | 60..... | 20.00 | 90..... | 22.50 |
| 30..... | 16.80 | | | | |

CYANIDING CONCENTRATE AT TARACOL, KOREA.

Written for the MINING AND SCIENTIFIC PRESS
By J. D. HUBBARD.

The old percolation process is regarded as a bit out of date at the present time, but there are still odd corners in the mining field where conditions make it necessary. Here in Korea it has been found profitable, although far from the high metallurgical standard of modern practice. The 'modus operandi' obtaining at the cyanide plant of the Oneutar Consolidated Mining Co., at Taracol, Korea, might be of interest to the metallurgical profession.

The concentrate treated consists of marcasite, 56%, galena, 36, sphalerite, 6, and arsenopyrite, 2. These percentages vary on different levels in the mines, but do not affect the extraction of the precious metals contained, as all these minerals (with the possible exception of arsenopyrite) offer no great obstacle to successful cyaniding.

Sizing tests on this concentrate also vary from time to time, and these materially affect the extractions. Two sets of sizing-tests showing about the limits each way, are as follows, the results being the average of several tests:

| No. 1. | | |
|------------|-------|-----------|
| Screen. | | Per cent. |
| On 50 | ..... | 16.4 |
| On 80 | ..... | 18.2 |
| On 100 | ..... | 12.0 |
| On 150 | ..... | 18.0 |
| On 200 | ..... | 3.4 |
| Passed 200 | ..... | 31.9 |

| No. 2. | | |
|------------|-------|-----------|
| Screen. | | Per cent. |
| On 50 | ..... | 23.4 |
| On 80 | ..... | 20.1 |
| On 100 | ..... | 19.3 |
| On 150 | ..... | 19.1 |
| On 200 | ..... | 4.1 |
| Passed 200 | ..... | 13.4 |

In treating a product like No. 1 an actual extraction of 86% of the total head is obtained, and on No. 2, 80%. All the product passing a 100-mesh screen gives a high extraction by percolation (over 90%), but this would not be possible if the fine product were treated by itself, as it would pack heavily. It is necessary to have a certain amount of coarse material to afford a proper leaching medium. This coarse product, that is, all material that is caught on a 100-mesh screen, contains most of the remaining gold after leaching, and this is the main defect of the percolation process for cyaniding concentrate. It will be necessary to re-grind this coarser product to obtain a better extraction, and the company is planning to this end. A tube-mill and agitation plant is to supersede the percolation plant.

The present plant consists of 18 circular percolation vats, 22 ft. diam. and 6 ft. deep, of riveted sheet-iron. A grating of wood is fitted into each tank, 10 in. from the bottom. This allows the necessary space for air and solution. On this grating a burlap filter-cloth is placed, and carefully wedged down

around the edges. On top of this burlap filter, Korean rice-straw mats are placed, to protect the burlap from the points of the shovels. Sixteen mats are used to cover each filter-bottom, and cost 22½c. each. They last one year, and the burlap filter-cloths from three to five years. These rice-straw mats are unaffected by strong cyanide solutions, and only have to be changed when the mesh becomes filled and cemented with fine concentrate. Aeration prolongs the life of both filter-cloths and mats, by forcing the fine concentrate up and out of the mesh.

Four settling tanks, each eight feet square and four feet deep, receive the gold-bearing solution from the percolation vats. One tank is used for wash-water, one for weak solution, and two for strong solution. Proper piping connects the percolation vats with the settling tanks. Aeration is carried on through the same pipes, by using an extra valve on each pipe from the main air-pump line.

Eight zinc precipitation-boxes, 14 ft. 10 in. long by 2 ft. 15¼ in. wide, are used for the precipitation of the gold and silver from the solutions. There are eight compartments in each box, each compartment 18 by 34 by 24 in. deep, and containing 9 cu. ft. of zinc shaving. One box is used for weak, one for wash-water, and six for strong solutions. There are three circular, riveted sheet-iron sump-tanks, 25 ft. diam. and 10 ft. deep. One is used for strong solution, one for weak, and one for wash-water. Duplicate 4-in. centrifugal pumps handle the solutions with ease and economy. One pump is held in reserve in case of accident to the other. A Hampton zinc-lathe with 36-in. mandril, cuts the necessary zinc shavings. From 1800 to 2600 lb. of zinc shaving is used per month. Vacuum and air-pumps, filter-boxes, a small crusher for slags and fluxes, also melting and roasting furnaces, complete the equipment. There is a well-stocked laboratory for testing and chemical analysis.

The fresh concentrate from the mills is trammed by gravity in one-ton cars to the cyanide plant, weighed on platform scales, and net weight of wet concentrate recorded in the scale-book. Two samples are taken from each car, one for assay and one for moisture. Care is taken that the sample-rod be driven to the bottom of the car, to insure a good sample. The day's run of fresh concentrate is then dumped into the vat ready for it. A few cars of coarse sand from the 'spitz' boxes in the mill, are mixed in with the concentrate in the charge, at the discretion of the operator. The concentrate is drawn off the vanners in the mills with from 30 to 50% sand. This mixture has been found to be necessary in practice, to secure a good percolating medium, and a better extraction. Without the sand, the charge 'packs' in the vats, and a poor extraction results. Lime is also mixed with the charge at the rate of 2½ lb. per ton. This gives us a protective alkalinity of between 0.50 and 0.60% (in terms of N/10 oxalic acid), which is just right for the solution. A lower protective alkalinity causes a higher consumption of cyanogen, and a higher one causes a crust to form in the sump and main pipes of lime and iron carbonate. This caused considerable annoyance and loss of time, with the protective alkalinity.

ity at 0.70%, as the pipes had to be disconnected and the crust cleaned out. This question of protective alkalinity has been experimented on and discussed by many prominent metallurgists, with varying results. Some claim a regeneration of cyanogen by carrying a high protective alkalinity; the regeneration obtaining from the double cyanide of zinc, the alkali decomposing the same, forming zinc hydrate and liberating cyanogen. This is not the case here. After a series of careful tests, covering several months, on working and sump-solutions, I found that excessive protective alkalinity did not regenerate cyanogen in the working solutions, and but slowly in the sump-solution. Tests on a sump-solution allowed to remain quiet, showed a slight regeneration of cyanogen from day to day, until, at the end of two weeks it remained stationary. The solution on entering the sump tested as follows, these results being the average of several tests: total cyanides, 0.48%, free cyanide, 0.23%, protective alkalinity, 0.76%. After one week the free cyanide increased to 0.26%, and after two weeks to 0.28%, where it remained. Tests on the main working solution, constantly in circulation, did not show regeneration, and as the pipes caked so rapidly as to become ineffective in four days to one week's time, I was obliged to drop the protective alkalinity to a normal point, which was found to be 0.55%. A few hundredths either way did not cause any inconvenience or loss. I hope to take this matter up more fully in a future article.

After the leaching vat is charged to its proper capacity, a wash of clean water is run on and allowed to percolate for 24 hr. This water is heated in winter. The water-wash carries out all soluble sulphides and acts on the lime which removes all traces of acidity, and leaves the charge alkaline, and in a receptive condition for the cyanide solution. This wash is run directly to waste, as it is very low in value, 0.02c. being the average per ton of solution. This small value is taken mainly from the pipes in passing through.

In the past, a preliminary weak-solution was run on the new charge, and allowed to flow through the weak zinc precipitation-box. It caused all kinds of trouble, a large quantity of the soluble matter settling in the head-compartments of the weak-precipitation box, necessitating the cleaning up of the same every other day. It also gave from 200 to 350 lb. of practically valueless matter in the precipitate, which had to be melted down with the rest on the clean-up. The preliminary water-wash does away with this trouble.

After 24 hr. washing, a strong cyanide solution is run on the charge (0.48% double cyanide, or $2\frac{1}{2}$ lb. KCy per ton of concentrate); and allowed to percolate for 16 days. Then a weak wash for 12 hr., and a water-wash for 12 hr., thence to the dump. The charges drain down to 18% moisture before going to the dump. Each charge is changed twice during its cycle of treatment (18 days), by shoveling over from one tank to the other. This labor is done by the Korean coolies, 12 on each shift. The 18 percolation vats in use are divided into six series of three vats each. This allows two complete changes or turning over of the charge. One vat is discharged to the

dump each day, and one vat filled. At present the mill is treating 2100 tons of fresh concentrate per month, or 70 tons to each charge.

Aeration is carried on intermittently, two vats at a time, for a period of one hour each. A two-cylinder, clack-valve, plunger-pump, made in the company's Taracol shops is used. It only consumes $3\frac{1}{2}$ hp., and requires little attention beyond oiling. Constant aeration is an important factor. Without it the total extraction not only falls off alarmingly, but necessitates a frequent renewal of working solutions.

The gold-bearing solutions from the percolation vats are run to settling tanks, and from there to the zinc precipitation boxes. The rate of flow for each box is $10\frac{1}{2}$ gal. per minute. The total extraction is excellent, the head varying from \$1.40 to \$3 per ton of solution, and the tailing from a trace to 0.06c. per ton. From the precipitation boxes the solutions are run to the sumps, where they are strengthened by the addition of the necessary KCy, and from there pumped back onto the charges. Clean-ups take place twice a month. The first clean-up is only a partial one, three or four of the head-compartments in each of the strong-solution boxes being cleaned. An accumulation of precipitate in these head-compartments, below the screen, prevents the free circulation of solution, necessitating a clean-up. The precipitate is run to a filter-press, where the solution is separated from the slime or precipitate by a vacuum-filter. When dry, the slime is removed to the strong-box to await the final clean-up at the end of the month. On the 30th of each month the regular clean-up is started. The strong-solution boxes, launders, filter-boxes, precipitate box, and others are unlocked and made ready. The clear solution from the zinc-box compartments is siphoned off carefully and goes to the sump. The zinc is then removed and well scrubbed by the Korean boys. These Koreans are not as thick-skinned and immune to cyanide sores on the hands and arms as the Kaffirs, so each boy greases his arm to the elbow with vaseline. The slime is tapped off through the lower plug in each compartment, and run to the filter-box, and the vacuum-pump started. The compartment is then washed thoroughly, the plug and screen replaced, and the washed zinc put back. The short-zinc goes to the head-compartment in each box, and is all consumed by the following clean-up. Fresh zinc is placed in the compartments not filled by the old zinc. The practice here is to let the zinc run down pretty low in the compartments by the clean-up, thus giving less bulk to handle. Care is taken of course that the solutions do not 'channel' or make holes in the zinc, and it is found that the precipitation is just as good. Care is taken not to stir up or disturb the zinc shavings in the compartments during the month, but to add fresh shavings on top of the old, very carefully, when needed. Every time the zinc shavings are agitated or stirred (to loosen the slime), a considerable loss occurs; much fine precipitate is carried over to the sump, where it is lost. As the precipitated gold is then in an allotropic form, it is not re-dissolved in cyanide solution, and consequently, when the sump solution is pumped back for leaching, the precipitate is caught in the charge and lost.

An operator, in describing this slopping around of the zinc-shaving to shake the precipitate off, will say, "after allowing the slime to settle," the "solution is turned on." But if any operator can make this same slime 'settle' naturally, and a portion not rise and overflow the instant the solutions are turned on (I do not care if he settle them a full month), I will confess I had something to learn on that point. This class of practice parallels the decadent mill-man, who has his secret 'dope' to put in his batteries, thereby saving more gold from the ore than Nature originally put there. When the compartments get 'dead' or in bad shape, they are cleaned but never stirred up. After the boxes are all cleaned and the slime collected in the filter, and vacuum-filtered dry, it is removed to the precipitate box, preparatory to roasting.

About 100 lb. of the slime is charged into the roasting pan, and spread out evenly. The furnace is then fired with wood. The slime is not disturbed until the pan-liner shows red through the cracks in the charge, and then the lumps are carefully broken with a hoe made for that purpose. This causes a minimum of 'dusting'. Continual stirring and breaking up of a charge in the pan always causes a maximum of 'dusting'. There is a hood over the pan, and dust chamber 6 by 3 ft. 18 in. of riveted sheet-iron, and using the greatest possible care in roasting, there was still obtained in the past year a little less than \$500 from the dust chamber. When the roast is 'sweet', or will not show any sparks on stirring, it is carefully removed from the roasting pan to a fluxing pan, and then taken to the scales. The fluxing charge consists of 45% borax, 30 old slags (preferably from the assay office), and 25 coarse sand, and is mixed with the roasted precipitate while hot. This also avoids loss by 'dusting'. The coarse sand contains a quantity of pyrite, and this materially assists in the formation of the matte on the gold button. This matte is a benefit, as it keeps the slag values down. One month clean sand, free of pyrite, was tried, and scarcely any matte was formed, the slag running up in value.

A former operator here informed us that the iron to supply the "matte forming element" was derived from "scales from the roasting pan", but this is not so. No iron scales are obtained until roasting the last charge is finished, and these scales are picked out and thrown with the slag, as they contain trifling amounts of gold. They will not even melt in the crucibles, but hold back when the gold button is poured.

The melting furnace consists of three circular pits, 30 in. deep and 22 diam. These pits are on three sides of the stack, and the roasting furnace is on the fourth side. Charcoal is used for fuel, as it is the most readily obtainable. The price of either coke or oil is prohibitive. No. 80 black-lead crucibles are used, as they have proved to be the most economical size for this size of furnace. These crucibles are charged three times for each melt, and then poured into a conical mold. When cool the top slag is knocked off, and the gold button with the matte-capping put in the safe.

American or English crucibles are good for from

14 to 20 melts, while the Japanese crucibles are only good for 7 to 11 melts, although cheaper in price. The American or English crucibles have proved to be the most economical in the long run here. After the month's run of slime is all melted down into buttons, the matte is separated from the gold, and put through the crusher. It is then charged into the crucible with alternate layers of borax, matte, cyanide, and sand, and given two full heats in the furnace to 'cook' it thoroughly. The sand retards the reducing action on the crucibles, thereby prolonging their use. The resultant button is high in silver, and contains a small amount of gold. An average bullion-assay on the matte-bars gave, gold fineness 42.96, silver fineness 269.51, and base 687.53. Sometimes the silver will run up to 600, but the gold remains the same. The gold buttons are run into bars. The slags from the clean-up, assay from 22 to 60c. per pound, and are treated in a special blast-furnace.

There are two other cyanide plants on the concession, one at Candlestick, and one at Kuk San Dong. The Candlestick plant is shut down at present, as the mine was behind in development. When it starts again there will be some radical changes, as the agitation process did not prove altogether a success. The chief troubles were the high cost of treatment, and the errors made in the mechanical construction. In practice it was found that the agitation plant was only able to handle the pulp from five stamps, instead of ten. The extraction was good.

The Kuk San Dong cyanide plant is operating on a low-grade concentrate with satisfactory results. Practically the same conditions obtain there as at Taracol, and the same process is used. It is intended shortly to install tube-mills for re-grinding the concentrate, and change the plant, to secure the highest economical extraction of the gold and silver in the pulp.

ASPHALT PRODUCTION.

According to the United States Geological Survey, the output of natural asphalt, related bitumens, and bituminous rock that entered the market from quarries and mines in the United States in 1908, together with refined asphalt produced from the crude material, was 185,382 short tons, valued at \$1,888,881, as compared with 223,861 tons, valued at \$2,826,489, in 1907. The largest item in the 1908 output was oil asphalt, which amounted to 102,281 tons, valued at \$1,322; this also showed a decrease from the 1907 output. Bituminous rock (37,371 tons, valued at \$146,821), gilsonite (81,533 tons, valued at \$61,824), and maltha (12,875 tons, valued at \$162,000), were next in order of importance. The imports of asphalt in 1908, mainly from the island of Trinidad, but in part from Bermudez (Venezuela), Cuba, Germany, Italy, Mexico, and a few other countries, were 151,674 tons, valued at \$624,979. During the fiscal year ending June 30, 1908, domestic asphalt and manufactured asphaltic material to the value of \$451,968 were exported from the United States, an increase of about 20% over the exports in 1907.

The output of gilsonite exceeded 10,000 tons. This asphaltic mineral came exclusively from Utah, where it occurs in veins of great size.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Magnesite was imported into the United States in 1908 to the extent of 84,494 tons, having a market value of \$736,763, or \$8.72 per ton.

Foliated is proposed by E. S. Bastin as a convenient comprehensive term to include all rocks showing foliated structures other than bedding planes. Its use avoids frequent repetition of the two terms schists and gneisses and avoids any postulate as to the primary or secondary character of the foliated structure.

Graphite is concentrated by log-washers and bud-dles. The product is then dried and subjected to further cleaning by air-jigs. Re-grinding is also practiced, the tube-mill commonly being employed for that purpose. The finely ground graphite is then refined by pneumatic separation in machines specially designed for that purpose.

Tantalum is used chiefly in the manufacture of incandescent electric lamps. Such lamps are said to consume fewer watts per candle-power, and to produce a light of exceptional whiteness and brilliancy. Also they will stand sudden increases of current without burning out. A tantalum lamp will last from 400 to 600 hours, requiring from 1.7 to 2.1 watts per candle-power.

Trinidad asphalt is well known. The surface of the famous pitch lake is about 138 ft. above the sea; its area is 100 acres, and borings have shown that it fills a bowl-like depression with steep sides and a depth of more than 135 ft. This lake has been estimated to have a minimum available content of over 9,000,000 tons. More than 2,000,000 tons have been removed and exported since records have been kept. The exports in the year ending January 31, 1909, were 150,557 tons, of which 98,098 tons came to the United States.

Map models may be conveniently made by marking on separate glass plates the working for each level. The individual plates should then be placed one above the other in a rack, the vertical distance between plates being proportional to the distances in the mine between levels. While the workings may be painted on the glass. A quicker and more convenient way is to use strips of adhesive tape such as is sold by stationers for passe-partout work. This tape can be obtained in various colors, but will usually need to be trimmed to make it conform to the scale of the model.

Carbon or so-called safety inks are used for drawings, drafting and the drawing of monetary instruments. They are always thick, stringy and are unsuitable for a free flowing writing fluid where anything else can be used. They, as a rule, are made by triturating lampblack with gum arabic and oxalic acid, and are thinned with water. Ink so made, while resisting acids and the alkalis, will oftentimes yield to the washing with pure water, as they do not

penetrate the paper to any extent. Skillful manipulation of the acids and alkalis separately or together will remove them. The only safety in their use is in connection with sensitive or safety paper.

Ammonia is a solvent for the native carbonates of copper, malachite and azurite, as well as for both cupric and cuprous oxides. Ammonium carbonate also dissolves these salts. Concentrated ammonia is not necessary for this purpose. The only drawback is the cost of ammonia. If a large demand were made in the vicinity of coalfields it could be cheaply obtained as a by-product in retort coking; but copper ores are usually nearer available supplies of cheap by-product sulphuric acid, which is practically better for leaching and subsequent precipitation. We are not aware of ammonia-leaching being practised on a working scale in the United States.

Tellurides of gold and silver are capable of completely precipitating gold from its solutions. This was shown by experiments made by Lenher and Hall on gold-chloride solutions. The association of free gold with tellurides is due in part to reconcentration from gold carried down in veins by descending waters, the tellurides serving as the precipitating agent. Also free gold is thrown down in the same way from ascending solutions. This is thought to have occurred in the Kalgoorlie district, in western Australia. The tellurides are almost universally associated with gold ores, accompanied with iron pyrite and other sulphides. It is generally conceded that the presence of tellurides indicates a deep-seated origin of the gold-bearing solutions.

Mineral paints may be divided into three groups—(1) natural products such as ochre, umber, sienna, hematite, siderite, limonite, ground slate and shale, which after mechanical treatment, such as cleaning and grinding, are either used directly as pigments or are first roasted to give certain desired colors; (2) chemical products, such as zinc oxide, leaded zinc oxide, zinc-lead, sublimed white lead, and sublimed blue lead, which are made directly from ores of valuable metals; and (3) chemical products such as basic carbonate white lead, litharge, red lead, orange mineral, lithopone, and Venetian red, which pass through several metallurgical and chemical processes in their preparation from the original ores.

Costs of open-cut mining vary with conditions. At the Boston Consolidated, in Utah, the following figures are given:

| | |
|--------------------------------|----------|
| Supervision | \$0.0034 |
| Operation, well drills | 0.0134 |
| Operation, air drills | 0.0066 |
| Blasting | 0.0308 |
| Operation, steam shovels | 0.0588 |
| Operation, railroad | 0.0435 |
| Dumps | 0.0147 |
| Operation, tram and ore-bins.. | 0.0020 |
| Shop, tools and machinery.... | 0.0078 |
| Maintenance of buildings | 0.0002 |
| Miscellaneous | 0.0013 |

Total, per ton.....\$0.1825

Publications Received.

Any of the books noticed in these columns are for sale by or can be procured from, the MINING AND SCIENTIFIC PRESS.

PROGRAM DER TECHNISCHEN HOCHSCHULE, ZU AACHEN, 1909-1910. Pp. 193. Aachen, 1909.

ANNUAL CALENDER, MCGILL UNIVERSITY COLLEGE OF BRITISH COLUMBIA. Session 1909-1910. Pp. 62.

THE EFFECT OF OXYGEN IN COAL. By David White. U. S. Geol. Survey, Bull. 382. Pp. 74. Washington, 1909.

FAUNA OF THE CANEY SHALE OF OKLAHOMA. By George H. Girty. U. S. Geol. Survey, Bull. 377. Pp. 75. Pl. 13. Washington, 1909.

SOME RECENT ADVANCES IN THE SCIENCE OF PHYSICS. By O. C. Lester. Proc. Colorado Sci. Soc., Vol. IX, pp. 217-234. Denver, 1909.

PRE-CAMBRIAN GEOLOGY OF NORTH AMERICA. By C. R. Van Hise and C. K. Leith. U. S. Geol. Survey, Bull. 360. Pp. 939, 2 col. maps. Washington, 1909.

This report is a revision of the Correlation Essay published in 1892, and a compendium of pre-Cambrian geology, with a general account of the pre-Cambrian rocks, followed by summaries by districts.

Catalogues Received.

THE CYCLONE DRILL CO., Oroville, Ohio. Bulletin No. 3. Mounted Core Drills. Illustrated, 44 pages, 6 by 9 inches.

INGERSOLL-RAND CO., 11 Broadway, New York. Bulletin 4004, 'Arc Valve Tappet Rock Drills'. Illustrated, 12 pages, 6 by 9 inches.

ERNST WIENER CO., 50 Church street, New York. Catalogue No. 200. Industrial Cars and Track Material. Illustrated, 130 pages, 6 by 9 inches.

D. D. DEMAREST CO., 503 Market street, San Francisco. Circular 27. 'Pacific Stamp Stem Guides'. Descriptive of an all-metal renewable guide of stamp stems. Illustrated, 8 pages, 7 by 10 inches.

THE HAYWARD CO., 50 Church street, New York. Catalogue No. 36. Digging Machinery. Contains a great many excellent views of engineering work where Hayward buckets have been used. A terse explanation accompanies each picture and makes the book of great value. Illustrated, 111 pages, 9x6 inches.

Wire-Rope Sockets.

All wire-rope users will want a copy of a little booklet just issued by the John A. Roebling's Sons Co., Trenton,



New Jersey, entitled 'Wire Rope Sockets'. It contains a minute description of the right way to attach sockets to wire-rope. The instructions are made clear and more interesting by the use of a number of admirable illustrations, one of which is reproduced herewith. It is certain that fewer accidents, due to failures of cables, would occur if all

connections were made in accordance with this method. Included in the booklet are illustrations of numerous wire-rope fastenings and hooks.

New Inverted-Type Assay Balance.

Recently in America there has been a revival of the inverted-type of assay balance, one of the earliest designs of European makers of precision balances, although now given an inferior position abroad, due largely to the more energetic development of the familiar form with dependent pointer or indicator. The accompanying illustration shows a new model just put out by a leading maker, and having numerous improvements over existing types.

The beam is of truss design, made of hard rolled magnesium, an alloy equal in strength and of about one third the weight of the brass or bronze commonly used, effecting thereby a reduction in the inertia of the moving parts with a consequent increase in speed and sensibility. The rider-carriers have no metal-to-metal surfaces in sliding contact, hence are smooth in operation under adverse working con-



ditions. The graduations are in hundredths, on a celluloid index, each division representing 1/100 of the weight of the rider used. The end-bearings are of one solid piece of agate, supported by agate contact-points when at rest, and the releasing mechanism is of improved design, thereby eliminating the disadvantages of earlier balances of this type, operating absolutely without 'kick'.

The unite-base carries the entire mechanism above the glass base, and maintains perfect alignment under all conditions, and having less than one half the parts of other balances of this type, its simplicity and the ease with which all parts may be removed for cleaning and replaced without disturbing their adjustment will appeal to users, at a distance from the factory. This balance is made by William Ainsworth & Sons, makers of balances and engineering instruments of precision, Denver, Colorado, and is fully described in Bulletin A-9.

ACCORDING to an advance chapter of 'Mineral Resources of the United States, Calendar Year 1908', just published by the Geological Survey, the production of natural mineral paints in 1908 showed little change from that of 1907, increasing by only 1307 tons, or \$6056. The 1908 output was 49,853 tons, valued at \$536,544. The production of pigments made directly from ores was 75,133 tons, valued at \$6,946,283, as compared with 95,211 tons, valued at \$8,939,332, in 1907. The output of chemically manufactured pigments amounted to 182,364 tons, valued at \$20,708,940, as compared with 186,677 tons, valued at \$23,119,692, in 1907.

L. VOGELSTEIN & Co. give the following figures of German consumption of foreign copper for the months January to July 1909:

| | Tons. |
|----------------------------|--------|
| Imports of copper..... | 94,681 |
| Exports of copper..... | 4,512 |
| Consumption of copper..... | 90,169 |

as compared with consumption during the same period in 1908 of 89,819 tons. Of this quantity 86,813 tons were imported from the United States.

Uses and Limitations of Electrolytic Amalgamation.

By J. H. JORY.

Brief outlines have been given of the methods of electrolytic amalgamation, in regard to the forces employed, the manner in which these are controlled, and the results obtained in practice. It may be again said that the system comprises mechanical, chemical, and electrical processes, so combined as to produce, almost instantly, a powerful amalgamating force on all precious metallic particles present in pulverized ores, as they flow through the apparatus in a stream of water.

Under this force all such particles are carried to the lower plate, which serves as the cathode, where they become amalgamated and adhere; uninfluenced by the scouring action of the flowing sands. The results obtained are a very perfect recovery of gold and platinum from all kinds of sands or ores, no matter how coated these precious metals may be, or in however finely divided a condition they may be found, depositing metals in suspension as readily as those in solution. It performs this work in the



Jory Electrolytic Amalgamator.

one operation, without re-handling of the ores; there is no loss of time in concentrating, leaching, or filtering; and the expense is as low as one fifth of that in other operations, approaching this in efficiency. This system of recovery applies to every form of gold-bearing sand, and may be used by the hydraulic miner, or the gold dredger.

The system may also be used by the quartz-miner in the extraction of gold, whether these ores contain sulphides or not.

In the cut, illustrating this article, is shown a carefully constructed sluice employed in electrolytic amalgamation. This is now being used in the laboratory of the Noble Metals Recovery Co., in San Francisco, for testing purposes. It has a capacity of six tons of ore per 24 hours, and is the smallest size designed for practical work. It may be used for prospecting either on quartz, or in placer claims. A larger apparatus capable of treating 100 tons is the standard size, as now contemplated.

For hydraulic mines it will take the place of the under-

current. On the dredge several of these sluices may be used to take the place of the apparatus now relied on. In the stamp-mill it simply takes the place of the well-known plates, and is designed to produce results rendering unnecessary both the concentrator and the cyanide process.

In connection with the sluice shown in the illustration, there has recently been introduced into this laboratory, a new system of assay by electrolysis. It has been found perfectly reliable for a number of determinations which aid greatly in arriving at a knowledge of the conditions necessary to perfect work on a larger scale, as well as in giving the exact values of ores and sands operated on. This electrolytic system of assay takes the place of the fire assay in its control of the amalgamation process, as it is found as reliable as the latter in its determinations, and is more flexible in its range of work, as it may be operated equally well on quantities as large as ten assay tons, as on one-fiftieth of that amount.

As this forms a part of the same electrolytic system as the larger apparatus, and is controlled by the same conditions, the electrolytic assay serves as a reliable check on larger operations.

There are certain limitations to the perfect work of the electrolytic amalgamation system. In common with all processes, there are conditions which must be complied with, in order to obtain the required results. In the first place, the apparatus must be properly constructed so as to act automatically in its discharge of sands, and to be readily and precisely adjusted to the varying differences in the gravity of ores, and the quantities that may be introduced.

It is necessary that the apparatus be so constructed as to cause no impediment to the flow of sand or difficulties arise. The construction must also be such that every particle of flowing sand must pass between the two poles of the apparatus (the anode and the cathode), or else no perfect work can be done. Such materials must be used in the construction as will not act adversely to the operations or corrode, and lessen the electric conductivity. The dynamo must be of proper capacity, and adapted to the work in density and tension of current, and the recording instruments must be of the proper range, and correctly set up, for without these the operator is as much at sea as the mariner without a compass.

In performing the work it is always necessary that the anode and the cathode be both in connection with the flow of the sand that passes between, or else no work is done. There is no such thing as the 'electrolysed water' we sometimes hear about. All work is done at the anode and cathode surfaces.

Sand from placers generally needs only to be screened from the coarser material to give perfect results; but ores require to be pulverized to the fineness that is found necessary to free the gold from its matrix, a requirement, be it noted, that extends to every hydro-chemical process where a full recovery of metal is required. In the electrolytic amalgamation system, each ton of ore, of whatever kind, is handled and finally disposed of in less than 15 minutes.

Commercial Paragraphs.

The KELLY FILTER PRESS Co., Salt Lake, Utah, has installed a filter press in the Star mill, Cherry creek, Nevada.

J. V. N. DORR, Denver, Colorado, reports among other recent sales of the Dorr Classifier; shipments made to Costa Rica, France, South Africa, and Ecuador.

The TRAYLOR ENGINEERING Co., Allentown, Pennsylvania, has opened an office in the Newhouse building, Salt Lake, Utah, with William T. Stephens as manager for Utah, Idaho and Montana.

The SULLIVAN MACHINERY Co., Chicago, announces that the Northern Canada Supply Co., Ltd., Cobalt, Ontario, has been appointed as its agent for the northern Ontario territory. The Rossland, B. C., agency of this firm is now in the hands of the Rossland Engineering Works.

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TABLE OF CONTENTS.

| | |
|--|-----------------------|
| EDITORIAL: | Page. |
| Notes | 477 |
| Protecting Mine Investors | 478 |
| President Taft and Shipping Rates..... | 479 |
| GENERAL MINING NEWS..... | 481 |
| SPECIAL CORRESPONDENCE | 485 |
| CONCENTRATES | 506 |
| DISCUSSION: | |
| Slime | Edward Parrish 492 |
| Continuous Sand-Filters | F. C. Frey 493 |
| Excess Ground in Mining Claims..... | Mark R. Averill 493 |
| ARTICLES: | |
| The Monterey Flood and San Luisito Bridge..... | Samuel J. Lewis 494 |
| Underground Waters in Semi-Arid Regions..... | W. C. Mendenhall 496 |
| Mine Inspection | Courtenay De Kalb 497 |
| Inspection of Mines | J. A. Holmes 499 |
| Mineral Areas in Korea..... | 499 |
| Petroleum in Burma | E. A. Wakefield 500 |
| Sand-Lime Brick | 500 |
| The Mining Man's Interest in Land Classification.. | George Otis Smith 501 |
| Gold Ore near Newcastle, Colorado..... | Forbes Rickard 503 |
| Dressing Amalgamating Plates | 503 |
| Assay of Cyanide Precipitate | Frank A. Bird 504 |
| Protection of Mine Investors..... | 505 |
| DECISIONS RELATING TO MINING..... | 508 |
| DEPARTMENTS: | |
| Personal | 480 |
| Market Reports | 480 |
| Company Reports | 507 |
| Publications Received | 508 |
| Dividends | 508 |

EDITORIAL.

TO date Mr. Peary seems hardly to have established the proposition that Cook should be spelled with an r.

BY ERROR two papers appearing in this issue and read before the American Mining Congress are marked as written for the MINING AND SCIENTIFIC PRESS. We may only claim that they were written for us, in common with all others interested in the mining industry. We regret that we do not have more frequent exclusive contributions from Mr. George Otis Smith and Mr. J. A. Holmes, the authors, but are glad to share, at least in publishing such good material.

SILVER is not to become an issue. This we judge from the cool determination of the men who refused to give it standing at the American Mining Congress. The appeal was made to those interested in the expansion of Oriental trade, but the alliance failed. We say this without feeling or prejudice. The silver miners find hardships in the present situation, and Mr. Moreton Frewen and his friends may be right in regard to the need of bi-metallism; but the beginning of a period of business revival would be an ill-selected moment for introducing uncertainties into the financial world. The American Mining Congress has, at least, displayed sound business judgment.

REPORTS have been current that negotiations were being conducted for the sale of the great Oroville, Marysville, and Folsom dredging properties in this State to English capitalists. The rumor also mentioned the sum of \$40,000,000, and connected the house of Wernher, Beit & Company with the transaction. The truth or falsity of this we have not ascertained, but we believe the rumor may have arisen from the fact that Mr. Eugene de Sabla recently offered several million dollars' worth of Natomas Consolidated bonds on the London market, and that Mr. Charles M. Rolker is now examining the dredging ground in the interest of the prospective underwriters.

SIGNIFICANT of the opinions of the leaders of copper production at Butte, Montana, was the attitude taken at the time of the recent strike. It afforded an opportunity to limit the output by closing some of the mines, but work was universally resumed as soon as the engineers and miners had settled their differences. One of the most encouraging spectacles in the metal world for more than a year past has been the bold expansionist policy shown by Mr. John D. Ryan and his associates, despite the unfavorable condition of the copper market. It dem-

onstrates that this powerful group of capitalists has analyzed the complex conditions of the manufacturing world on which the demand for copper depends, and that signs of growing prosperity are perceived.

BONDS are recommended by Mr. Taft to furnish funds for completion of the reclamation projects under way. It is proposed to ask Congress to issue them to the amount of \$10,000,000 and to provide for payment out of future receipts from the sale of the land. This seems a happy solution of a real difficulty. It is, we believe, important to preserve in the reclamation work the principle of repayment by the land, of the money spent on its improvement.

SOUTH AFRICAN milling practice is in a state of steady and rapid evolution. Amalgamation in the battery of the stamp-mill has practically been discontinued, and the tendency to use stamps exclusively for crushing has led to great increase in their weight. Furthermore the teaching of experience with crushing of Rand ores for tube-milling has shown that better results are obtained by employing screens as coarse as No. 3 mesh on the battery. This naturally admits of large tonnages. Tests are also being made with long-headed, short-stemmed stamps, the boss-heads being 48 inches and the stems 13½ feet long. If this continues we will yet see the short, thick stamp which Dr. Rossiter W. Raymond prophesied as much as 25 years ago.

GOVERNMENT operation of the so-called Provincial Mine on the Gillies Timber Limit in the Cobalt district of Ontario has seemingly proved a failure, and the property has been sold to the highest bidder. Mystery has surrounded the management of this mine from the beginning, and the reason for such secrecy has not been apparent. Errors openly confessed would have cast less reflection upon the Government than such shrinking from public inspection. In fact publicity is beneficial to both enterprise and manager. It compels careful economical work. If the officials cherished utopian dreams of winning riches which would reduce provincial taxation they have been awakened to a cruel disappointment; if there were darker dreams, the daylight of reality has sent them flying to their proper limbo.

CALIFORNIA was well represented at the Gold-field meeting of the Mining Congress. The San Francisco delegation, traveling in special cars and accompanied by a band, arrived early on the scene. At first there was much good natured comment on the absence of delegates from Los Angeles, but later in the week they arrived in force. Mr. E. H. Benjamin responded to the address of welcome on behalf of California recalling gracefully the many ties between Nevada and the Golden State. Mr. W. C. Ralston and Mr. Herman Zadig delivered addresses which led to much discussion. Mr. Douglas White served on the resolutions committee and many other Californians made themselves useful. Los Angeles has extended an invitation to the Congress for next year and the invitation is heartily seconded by the entire State.

HAWAII is to be topographically surveyed. The making of topographic maps is necessary to systematic development of the water resources of the islands through storage, and Mr. Robert Marshall, chief geographer of the United States Geological Survey, has gone to plan the work. Similar maps are sorely needed in developing the mineral resources of the Philippine islands. The excellent Bureau of Mines at Manila is more than loaded with work and it seems that there is here a proper field for Federal aid. The co-operation between the Geological Survey and the various States in the making of topographic maps has been particularly helpful and successful. The sooner the resources of the Philippines are developed, the sooner the United States will be free from numerous vexatious problems.

CHINA is again in the public eye. The recall to Washington for further instructions of Mr. C. R. Crane, the newly-appointed American minister, on the very eve of his sailing, was an extraordinary step, and has led to much speculation. It is well known that America desires to be especially friendly to China, and it is said that Mr. Crane's instructions were in general terms "to do anything helpful to China." Chinese diplomacy is, however, of such sort that this is not always easy. It is believed that Mr. Crane's journey to Washington for conference is in relation to the railway situation in Manchuria. The Imperial Railways of North China have proved to be one of the most profitable railway enterprises in the world. The lines are 600 miles long and the ratio of expenses to earnings only 28%. Net returns for 1908 were \$7,992,110. Profits are being used for railway extensions, and quite naturally China is trying to recover some of the concessions earlier given to Japan and other powers. It is worth remembering, however, that in the Fakumen incident a deliberate effort was made to involve England and Japan in a dispute and that fullest investigation showed the Japanese contentions to be well founded. One of China's skilled diplomats, Tang Shao Yi, a Columbia graduate as it happens, when questioned by the American Minister at Peking concerning the famous secret treaty with Japan, since published, denied its existence, although he was himself concerned in its negotiation. Americans sympathize with China in her present difficulties and wish their neighbor well, but it is needful at times to recall Truthful James' sage remarks on Chinese ways.

Protecting Mine-Investors.

The prime reason for interest in the protection of mine investors is to save the mining industry from being used as a basis for systematic swindling. There is no particular reason why special consideration should be shown to the weakness of those men and women who blindly rush into speculation in mining shares. Nevertheless, since the aim in milling is to obtain appliances that are 'fool-proof', an idea is growing that mining stocks must also be made as nearly 'fool-proof' as possible. If we are frank with ourselves we must admit that the ultimate purpose is to inspire public confidence, thus attracting into mining those great reserves of capital which are now persistently withheld from investment in

the mineral industry through fear of insecurity. Let us be even more frank and admit that the agitation now being made, and which has recently received the formal endorsement of the Mining and Metallurgical Society of America, is not divorced from a keen sense of personal advantage. Pecuniary benefit is certain to accrue to the mining engineer from the greater protection which may be thrown about capital utilized in mining ventures. Selfishness is a motive that leads to action, and it seldom can attain its ends without helping others in passing. What is to the advantage of the mining engineer is certain to be to the advantage of the capitalist. The engineer above all things desires permanency and profitability in mining operations. The capitalist desires the same.

It is manifestly proper, then, that a representative body of mining engineers should establish a basis for annual reports on operating mines. The greatest mines of the world are under the charge of mining engineers, and many of them are managed by the very men who have endorsed this resolution. What they practice will necessarily be emulated by others, and a healthy growth of custom must result. The details of the plan are given in another column of this issue. The report, according to this formula, would consist essentially of three parts: the manager's statement of the history of the property, with a detailed account of operations for the fiscal year under consideration; a demonstration of future expectations, based on ore reserves; and finally a directors' report dealing with the finances of the company, and giving a statement of outstanding shares, the classes and respective rights of such shares, with the usual balance sheet. This is not elaborate, but it is infinitely more than most stockholders ever see today. It would assuredly tend toward safety, and the recommendations of the Society should meet with cordial response.

President Taft and Shipping Rates.

Presidential utterances sometimes point the way to action, and a declaration of important policies was anticipated from Mr. Taft in San Francisco. The speech delivered at the Hotel Fairmont banquet on October 5, however, was lacking in this respect. It was jovial, and replete with those conventional commendations which are pleasing to local pride, but it left untouched the greater problems which engage the serious thought of men on the Pacific Coast. The complications suddenly arising in the Far East at the very moment of his visit rendered a discussion of Oriental trade and a naval program impossible. The only hint thrown out was that the maintenance of an adequate fleet on the Pacific could not be done at the cost of leaving the Atlantic sea-board undefended. The inevitable conclusion is that more ships are needed, a fact transparent to any man who has grasped the plain teachings of experience in the past. No great merchant marine has ever yet endured without a navy powerful enough to compel peaceful respect for its existence. We are interested to note in Mr. Taft's address a frank recognition of the need of encouraging our shipping industry. He handled the question with delicate touch,

making but a single definite recommendation. He would utilize a profit of about \$8,000,000 per annum from the foreign mail service in paying mail subsidies to promote the development of other steamship lines to the Orient, to Australia, and to Spanish America. This is good as far as it goes, and it may lead to important results, but it furnishes no broad outlook. The matter of foreign shipping is full of complications, and the mere paying of a bonus is not enough to call forth a merchant marine which will give us independence in international trade. The policy of the railroads has been to stifle not only lines sailing to foreign ports, but coastwise and internal water transportation as well. The principal steamship lines belong to the railroads, and serve as a menace to competition, by displaying the signal of disaster for whomsoever would attempt to encroach upon the field thus occupied. No man can say what proportions our shipping would have grown to if untrammelled opportunity had been presented. Manifestly it must be made illegal for any railroad to discriminate against water transport lines as a condition precedent to any large development of shipping. In other words, any line which may be established must enjoy the advantages accorded to the most favored existing line, thus automatically bringing all to the same level.

Even the United States Government has not guarded the welfare of the people against discrimination, with the opportunity it has through ownership of the Panama railroad. Only after a hard struggle were the rates on that road made independent of the rates fixed by the transcontinental railroads. Until recently the rates at Panama fluctuated in sympathy with them. Even today curious discriminations are found. For example, the rate across the Isthmus, that is, the Panama Railroad's proportion of the through rate, on machinery from New York is \$4 per ton when the goods are consigned to Central American ports, while the charge is \$8.10 when the machinery is destined to San Francisco. This is not a solitary case. Machinery coming from Europe to San Francisco pays \$4.59 per ton for transit at the Isthmus of Panama, while only \$2.97 is exacted when the consignment is made to Guayaquil, and \$3.64 when billed to Central American ports. Mr. B. N. Baker recently called attention, in the *Manufacturers' Record*, to these unjust discriminations as applied to hides. The same is true of many other articles, the rates imposing a distinct disadvantage upon the Pacific Coast, which tends to leave the railroads in undisturbed control of transcontinental freight. If this is an example of the manner in which the Government safeguards the welfare of the people, we can but doubt whether the proposed distribution of \$8,000,000 of mail-profits would not be for the benefit of the steamship lines now owned by the railroads, without leading to any increase in the number of ships flying the American flag. The principle of encouragement for a merchant marine is only an expansion of the principle of protection enjoyed by a multitude of industries, but legislation toward that end must take account of the fact that the same conditions which have hindered the normal growth of shipping will continue active unless the law renders healthy competition possible.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. K. BETTY is in London.
E. R. BUCKLEY is at Los Angeles.
CHARLES BUTTERS is in New York.
F. L. RANSOME is at San Francisco.
EDWARD ORTON is in San Francisco.
T. G. Gerdine has been in San Francisco.
J. A. HOLMES has gone to Seattle, Washington.
GEORGE OTIS SMITH is visiting Pacific Coast points.
R. J. FRECHEVILLE has returned to London from Mexico.
A. H. BROOKS reached Washington October 6, from Alaska.
REGINALD C. H. COOKE is on his way to Salisbury, Rhodesia.

U. S. GRANT has returned to Evanston, Illinois, from Alaska.

F. W. DEWOLF has been visiting Goldfield and San Francisco.

T. N. STANTON has returned from Mexico, and is at Globe, Arizona.

A. ROY HEISE is with the Union Oil Co., at Port San Luis, California.

F. KARL LAMB is at Edwardsburg, Idaho, for the Eagle Mining Company.

R. H. ELLIOTT has moved from Sacramento to Marysville, California.

A. E. DRUCKER is visiting the mines of the Transvaal, South Africa.

F. L. BOSQUI and AUDLEY H. ACKERMANN sailed for South Africa on September 11.

F. W. OLDFIELD has gone from Idaho to Hostotipaquillo, State of Jalisco, Mexico.

GEORGE F. MILLIKEN has removed from Jamestown, Rhode Island, to New York City.

E. D. LIDSTONE has returned from Cordova, Alaska, and is now in San Francisco.

CHAS. J. BANDMANN has finished his examination of British Columbia properties and is now in New York.

J. B. EMPSON, of Guanajuato, has recovered from typhoid fever in Mexico City.

JOHN MORGAN has been appointed manager of the South Kalgurli mine, at Kalgoorlie.

C. H. GREIME has left Fairbanks, Alaska, and will reside in Seattle during the winter.

LUIS BASABE, of the Guadalupe de los Reyes mine, Sinaloa, Mexico, is in San Francisco.

HERMAN GARLICHs will reside hereafter in New York City, instead of Perth Amboy, New Jersey.

JOSEPH RALPH is consulting engineer for the Russian Collieries Co., operating in southern Russia.

A. W. EDELLEN is superintendent for the American Smelting & Refining Co. at Anganguero, Mexico.

DAVID MCCLURE is returning from London to San Francisco by way of the Trans-Siberian railway.

FRANCISCO TARRIBA, manager of the Jesus Maria y Piramide mine, Sinaloa, Mexico, is visiting San Francisco.

G. H. COX is assistant professor of mineralogy and petrography at the Missouri School of Mines, Rolla, Missouri.

FRED T. WILLIAMS, of Park City, Utah, has been inspecting mines in the Ely and Hamilton districts, Nevada.

MARTIN MCLEISH, of Denver, Colorado, is testing the tailing at the Los Reyes mill, Peras camp, Oaxaca, Mexico.

JAMES JOHNSTON, of the Butters companies, passed through San Francisco from Copala, Sinaloa, to New York.

N. O. S. FORD has re-opened engineering offices in Oaxaca, Mexico, after a considerable absence in the Black Hills of South Dakota.

H. A. KENNEDY is building the mill and cyanide plant of the Yoquivo Development Co., in Chihuahua. He has just returned from Cerro de Pasco.

MAURICE CLARK has returned from England, accompanied by S. A. Crossley, of London, who is examining Mr. Clark's Sierra Juarez properties in Oaxaca, Mexico.

L. M. PRINDLE, A. G. MADDREN, and C. E. ELLSWORTH, of the United States Geological Survey, have arrived in Seattle from Alaska and will return at once to Washington.

J. A. PARKER has returned from Cortez, Nevada, and will sail, October 11, for Corinto, having accepted a position on the staff of the La Leonesa mine at Matagalpa, Nicaragua.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, October 7.

| | | | |
|--------------------------|------------|--------------------------|---------|
| Antimony | 12-12½c | Quicksilver (flask)..... | 45-46 |
| Electrolytic Copper..... | 15¼-16¼c | Spelter | 7-7¾c |
| Pig Lead..... | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|-------------|-------------------------|-------|----------|--------------------|
| Oct. 1..... | 12.87 | 4.34 | 5.94 | 51¾ |
| " 2..... | 12.87 | 4.34 | 5.94 | 51¾ |
| " 3..... | Sunday. No market. | | | |
| " 4..... | 12.81 | 4.34 | 5.94 | 51¼ |
| " 5..... | 12.81 | 4.34 | 5.96 | 51½ |
| " 6..... | 12.81 | 4.34 | 5.99 | 51½ |
| " 7..... | 12.81 | 4.34 | 5.99 | 51½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Sept. 30. | Oct. 7. |
|------------------------|-----------|---------|
| £ s. d. | £ s. d. | £ s. d. |
| Camp Bird..... | 1 11 3 | 1 9 9 |
| El Oro..... | 1 5 0 | 1 5 0 |
| Esperanza..... | 3 1 0 | 3 0 7½ |
| Dolores..... | 1 5 0 | 1 5 0 |
| Oroville Dredging..... | 0 14 0 | 0 14 0 |
| Mexico Mines..... | 6 7 6 | 6 8 9 |
| Tomboy..... | 0 19 0 | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING QUOTATIONS—NEW YORK.

Closing Prices.

| | Sept 30. | Oct. 7. |
|--------------------------|----------|---------|
| | 25¼ | 25¼ |
| Butte Coalition..... | 7½ | 6¾ |
| Cumberland-Ely..... | 7¼ | 7¼ |
| Dolores..... | 9½ | 9 |
| Giroux..... | 9 | 10½ |
| Greene-Canaan..... | 9½ | 9½ |
| La Rose..... | 16 | 15¾ |
| Miami Copper..... | 24¼ | 23¾ |
| Nevada Consolidated..... | 12¼ | 11¾ |
| Nipissing..... | 4¾ | 4¾ |
| Ohio Copper..... | 6¾ | 5½ |
| Yukon..... | | |

COPPER SHARES—BOSTON.

Closing Prices.

October 7.

Closing Prices.

October 7.

| | | | |
|-------------------------|------|---------------------------|-----|
| Adventure..... | 6 | Mohawk..... | 60 |
| Allouez..... | 58 | North Butte..... | 59¼ |
| Atlantic..... | 8¾ | Old Dominion..... | 53¼ |
| Calumet & Arizona..... | 100½ | Osceola..... | 155 |
| Calumet & Hecla..... | 660 | Parrot..... | 31 |
| Centennial..... | 39½ | Santa Fe..... | 17½ |
| Copper Range..... | 79¾ | Shannon..... | 15¾ |
| Daly-West..... | 8 | Superior & Pittsburg..... | 15½ |
| Franklin..... | 16¾ | Tamarack..... | 70 |
| Granby..... | 95 | Trinity..... | 11 |
| Greene-Canaan, etc..... | 10½ | Utah Con..... | 43½ |
| Isle Royale..... | 23¾ | Victoria..... | 3¾ |
| La Salle..... | 14½ | Winona..... | 7 |
| Mass..... | 7 | Wolverine..... | 150 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 7.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 12 | Midway..... | \$ 20 |
| Belmont..... | 78 | Montana Tonopah..... | 99 |
| Booth..... | 11 | Nevada Hills..... | 80 |
| Columbia Mtn..... | 10 | Ophir (Comstock)..... | 1.65 |
| Combination Fraction..... | 73 | Pittsburg Silver Peak..... | 70 |
| Daisy..... | 7 | Rawhide Coalition..... | 23 |
| Florence..... | 2.90 | Rawhide Queen..... | 25 |
| Goldfield Con..... | 6.60 | Round Mountain..... | 65 |
| Gold Keweenaw..... | 8 | Sandstorm..... | 7 |
| Great Bend..... | 6 | Silver Pick..... | 11 |
| Jim Butler..... | 12 | St. Ives..... | 9 |
| Jumbo Extension..... | 15 | Tonopah Extension..... | 51 |
| MacNamara..... | 30 | Tonopah of Nevada..... | 7.00 |
| Mayflower..... | 13 | West End..... | 28 |

General Mining News.

ARIZONA.

COCHISE COUNTY.

The Eastern stockholders, headed by John Lonergan of Bristol, have agreed to raise the money necessary to carry on the development of the Bisbee-Sonora mine at Shamrock in the Chiricahul mountains. Over \$65,000 has been expended on the property and several veins of smelting ore opened.—A good grade of lead carbonate and sulphide ore was opened by the cross-cut from the winze at the John A. Duncan group in the Paradise district. Several assays have run as high as 27% lead with some gold and silver. The present ore was cut at a vertical depth of 135 feet.

GILA COUNTY.

The Schulze group, nine miles west of Globe and three-quarters of a mile from the Live Oak, has been bonded to a company headed by Samuel Newhouse and John Dern for \$250,000, payable in 1911. A two-compartment shaft has been started and two churn-drills ordered to prospect the



Map of Arizona.

property which has been opened by several adits and shallow shafts. J. C. Dick will be in charge of operations

GRAHAM COUNTY.

Operations are to be resumed at the Morenci Mesabi property west of Morenci. Considerable work has been done on the claims and some rich silver ore shipped to the El Paso smelter.—The foundation for the Gold Belt mill has been completed and the machinery is being hauled to the mine. The pipe for the new water line has been purchased and it is expected that the plant will be in operation the early part of November. J. Blackstein is working the property under a lease.

MOHAVE COUNTY.

The mill of the Redemption Copper Mining & Milling Co. is to be started this month. Roe J. Ferguson is manager.—Estimates are being made on the expense of constructing a pumping plant to bring water from Silver creek to the Pioneer mines at Oatman.—Work is to be resumed at the White Hills mine. John F. Jones is superintendent.—A. E. Walker is shipping chrysoprase from his property west of Chloride to Denver.—At the Red Gap property the company is opening a 15-ft. vein that assays \$20 per ton.—L. D. Godshall has purchased the Bryan mine at

Stockton hill and the Little Jimmie property in the Union basin district. At the Bethel and Silver mines a 200-ft. shaft is to be sunk and the vein prospected at that depth. Thomas McGraw is in charge of the work.—The mill at the Gold Road mine, at Gold Road, is practically complete and will be started about the middle of this month.

YAVAPAI COUNTY.

(Special Correspondence).—The Arizona Mining Code Commission, consisting of W. L. Clark, of Jerome; W. F. Staunton, of Tombstone; Thomas Armstrong, of Phoenix; Mr. Campbell, of Crown King; and D. J. Hipple, of Globe, will meet at Phoenix, October 14, to formulate a code of laws and regulations to pertain especially to underground work and methods for safety. The commission's report will be submitted to the Governor, and by him to the Territorial Legislature at its next session.

Phoenix, October 2.

The Copper Creek Development Co. has installed a Star drilling rig at its property, 30 miles northwest of Hillside, to prospect the ground. The company's holdings are six miles long by four miles wide in the Eureka district, and the company is to install 11 more drills shortly.—The force at the Dividend mine, in the Big Bug district, has been doubled and the mill is being put in order for continuous operation. F. E. Biles is manager.—Plans are being drawn by W. Spencer Hutchinson, consulting engineer for the Vulture Mines Co., for a 20-stamp mill which will later be increased to 60 or 80 stamps. The shaft has been sunk to the 600-ft. level and drifts started on the vein which is 16 ft. wide and approximates \$20 per ton.—Dyson & Griffin shipped a \$700 gold bar and 12 tons of \$100 concentrate from the Capitol mine, in the Walker district, which they are operating under bond.

YUMA COUNTY.

The St. Louis Post Despatch, through W. G. Steigers, the manager, has purchased the property of D. W. Hall and R. C. Robinson in the Salome mining district for \$150,000.

CALIFORNIA.

BUTTE COUNTY.

(Special Correspondence).—The controversy between local dredge operators and the City of Oroville has taken on a more determined aspect. The attempt to prevent the Ophir Gold Dredging Co. from operating within the city limits has been checked by the granting of a temporary injunction by Judge Morrow, of the U. S. Circuit Court of San Francisco. The Indiana and Pennsylvania companies are also in trouble with the city governments.—The present season is one of the most prosperous that the local dredgers have ever known. Plenty of water is available and there is no danger of a suspension of activities owing to lack of power. Several new machines have been built this year.—The Mammoth Channel G. M. Co. in the Magalia district has completed the installation of its new plant in the main adit. The work of sinking the shaft to bedrock will shortly commence.—At the Blue Hog a compressor, machine-drills, and power plant has been completed.—The adit at the Magalia Ridge is in a good grade of gravel.—It is announced that the Northern California Mining & Development Co. will resume work on its Butte county properties. E. B. Jackson is president.—The management of the Steffer Mining Co. recently announced that active production will soon be commenced.

Oroville, October 5.

INYO COUNTY.

At the Gray Butte mine, southwest of Benton, the company is opening a 6-ft. vein of fair milling ore. George E. Austin is superintendent.—The transmission line at the Casa Diablo plant has been re-built to carry a higher voltage. The power plant is nearly complete and the power will be turned on in a few days.

MONO COUNTY.

(Special Correspondence).—The Golden Cycle Mining & Milling Co. and the Boston Masonic Mining & Milling Co. have been consolidated, and will operate as the Monalda Mining Co.—The difficulties between the True Friend and Jump-up-Joe companies have been adjusted, and work re-

sumed on both properties.—On the Sereta a small body of high-grade gravel has been cut.—The United States Gold Corporation is arranging for additional work at the Sunny Jim and adjacent groups.—Rich discoveries of gold-bearing ore are reported from the Desert creek district, about 15 miles from Bridgeport.—It is announced by Mr. Webber, manager of the Standard Consolidated mines at Bodie that operations will be resumed below the 800-ft. level. Powerful electric pumps will be installed.

Masonic, September 30.

NEVADA COUNTY.

(Special Correspondence).—The 200-ft. winze from the 3500-ft. level of the Empire has cut a body of good-grade ore. The mill is running steadily and the production is said to be approximately \$55,000 per month.—It is rumored that the North Star Mines Co. is arranging to resume operations at the Massachusetts Hill mine. The regular quarterly dividend of \$100,000 has been declared by the North Star Mines Co.—The Eureka mine has not been sold to Oakland capitalists, as formerly stated, but the property is being inspected, though nothing definite has been accomplished.—The orebody opened in the north drift from the 400-ft. level of the Kenosha is only a few inches wide, but assays well.—Cross-cutting for the vein will be soon started from the 700-ft. level of the Idaho-Maryland. On the 400 and 500-ft. levels it is 6 to 8 ft. wide and runs about \$20 per ton.—The owners of the Yellow Metals mine have let a contract to the Miners' Foundry of Nevada City for a small mill. A good tonnage of rich ore has been opened.

Grass Valley, October 5.

A 6-ft. vein of \$10 ore has been discovered on the Butler ranch in the Grass Valley district. The property is owned by W. A. Fields, of San Francisco.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The Garvanza Mining & Milling Co., controlled by Michigan men, began 3½ years ago to develop a group of nine claims situated five miles west of Leastalk station, and now have 2000 ft. of development completed. This opens a series of quartz veins, cutting through pegmatite granite. The veins are 20 to 75 ft. in width, and contain a complex ore of silver, copper, gold, lead, molybdenum, and thorium. The value of the silver, copper, and gold is about \$15 per ton of ore; the rare metals amounting to 0.5 to 1%. A mill of 100 tons capacity has been erected and is in operation. It is equipped with crusher, rolls, trommels, and Standard concentrating tables. The tailing, which contains some gray copper, molybdenum, and thorium, is chemically treated; and it is stated that after the lead is separated from the rest of the concentrate the remainder of the product is to be calcined, then leached in a new plant. H. M. Banfield, superintendent for the company, states that their method of treatment has been developed by tests at the mill and laboratory, and he is now satisfied as to results. The thorium is in the form of a nitrate and is worth \$14 per pound. The company is figuring on erecting a steam-electric power plant, in which crude oil will be used as fuel. The calcining and leaching plant to be erected will have a capacity of 30 tons of concentrate per day.

Vanderbilt, October 2.

SAN JOAQUIN COUNTY.

A flow of natural gas was struck while sinking a well on the property of T. A. Jordan near New Hope and a company has been organized to sink a bore-hole to see if the gas exists in commercial quantities.

SHASTA COUNTY.

Nineteen laborers filed labor liens against the Delta Consolidated Gold Mining Co. and the Inca Treasure Gold Mining Co., operating near Delta, pending the settlement of a suit which has stopped operations at the Delta Consolidated property.—The Yosemite Dredging Co. is building a dredge on the Sacramento river near the mouth of Salt creek. The boat will be 28 by 62 ft. and the dredge will be of the suction type.

SIERRA COUNTY.

The Sierra Mining Co. has put a new skip in the shaft

at its mine near Pike City.—The Omega Mining Co. has purchased the Casserly interest in the Manzanita gravel mine. The property joins the Omega group on the west.—The Sierra Buttes company has 10 men at work re-timbering the No. 6 adit of the Sierra Buttes mine near Sierra City.—At the Cleveland mine, in the Sierra City district, the mill is being repaired and an air-compressor installed. W. Warton is manager of the property.—The 3-stamp mill for the Oakland mine has been shipped to Sierra City, and will be hauled to the mine in a few days. There are 40 tons of rich milling ore on the dump.—A new vein has been cut recently at the Papoose mine, in Jim Crow canyon, that mills about \$8 per ton. The mill will be started under the direction of F. A. Maltby.—A drift has been run on the vein cut on the lowest level of the Gray Eagle mine and cross-cuts driven. The ore is 12 ft. wide and contains a large amount of sulphide. Edward Westall is superintendent.

TUOLUMNE COUNTY.

The electric power line is being extended from the Soulsby mine to the Draper property. A drift has been started on the vein recently opened on the 400-ft. level of the Soulsby.—A new shoot has been cut at the New Albany mine and the ore is being sacked for shipment.—A rich stringer of ore was cut at the Mangante mine, near Jamestown, while sinking a well on the property.—The main shaft at the Jumper mine is being re-timbered and it is reported that the company is planning a large amount of development.

YUBA COUNTY.

The Black Swan, near Smartsville, has been unwatered and the stopes are being sampled to determine the trend of the ore. On the lowest level the shoot has been opened and the company will prepare to commence stoping there shortly. Some good ore has been opened also at the Marc Anthony mine in the same district.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Argentine Exploration Co. has purchased the Mammoth group of claims on Leavenworth mountain and will commence shipping shortly. B. J. Martelon has been appointed manager and states that at an early date work will be commenced on a 25-ton mill.—A new vein has just been cut in the heading of the Prudential adit.—Work was put under way this week upon the Queen City property. G. W. Teagarden is manager for the new company.—W. Farragher, leasing the Astor mine, is shipping high and medium-grade ore. The first-class product mills from 400 to 450 oz. silver per ton, while the lower-grade is worth \$40 per ton silver and lead.—Bryant & Co., leasing the Hercules level of the Seven-Thirty mine, have cut an 8-in. streak of smelting ore that assays 650 to 700 oz. silver per ton.—Work has been resumed upon the holdings of the Ruby-Argentine Mining Co., in the Peru district. L. W. Vidler is manager.—The building of the new mill of the Western Metals Co., which is to be equipped with the Malm process, is progressing in a satisfactory manner. One of the buildings is completed, while the second will be finished about October 15. It is stated that the machinery will be shipped some time during the next two weeks.—Hafer & Co., leasing on the third level of the Little Mattie property, have cut an 8-in. streak of rich ore. A carload sent out last week was settled for at the rate of \$300 per ton.—J. N. Bradley, of Idaho Springs, has taken a lease upon the Victor mine on Seaton mountain.—A rich find is reported from the Chicago Belle property of the General Consolidated Mining Co. on Onicago mountain.

Georgetown, October 4.

GILPIN COUNTY.

A contract is to be let to sink the Cook shaft of the Fifty Gold Mines Co. 200 ft. This will make a total depth of 1600 ft.—A new shaft-house has been erected at the Alps mine on Quartz hill and an 80-hp. boiler added to the power plant. Recent shipments of ore to the Chamberlain sampling works assayed: gold 15 oz., silver 54 oz., copper 12%; and gold 6 oz., silver 25 oz., with 5% copper.—L. G. Nesmith is unwatering the Kirk mine on Quartz hill and operations will be resumed. The mine has a record of pro-

ducing high-grade pitchblende and uranium ore.—The Tungsten Mines Co. shipped a carload of concentrate to Denver last week, and it is understood that this company will now be on the list of regular shippers.

GUNNISON COUNTY.

Reinhardt Holloway has opened an orebody on his property in the Gothic district that assays 12% copper.—A cross-cut is being driven in the Blain mine to open the orebody near the old shaft, and the company is repairing the dam at the mill which was damaged by the high water last winter. Archie McLeod is superintendent.—C. C. Bruner is preparing a shipment from the Sunnyside group of 50 tons smelting and 80 tons milling ore.—Charles Young, of Monmouth, has purchased the Gothic smelter and is making arrangements to have the plant remodeled.—The Victor mine at White Pine has been sold to the Miami Mining Co. of Boston.

LAKE COUNTY.

A Denver company, for which C. E. Dewey is manager, has purchased the old plant of the Harrison Reduction Co. in Leadville, remodeled it, and will operate on the iron-zinc-lead ores of this district. The Boston-Arizona Mining & Milling Co. installed considerable machinery in the plant several years ago, but it was not a commercial success at the time. It is now thought that the plant can be made to pay on account of the tariff on zinc ores. The initial capacity will be 75 tons per day.—A rich seam of ore was cut by the winze in the St. Louis adit at a depth of 150 ft. J. B. Stewart is manager.—The Ontario adit at Twin Lakes has cut two new veins recently and stoping has been started on each.—The Blanche mine is being re-opened by George Champion and associates.—The Vinnie property has been equipped with new machinery and is shipping regularly through the Yak tunnel.

OURAY COUNTY.

The drift from the Atlas workings on the Klondike vein is still in a rich silver ore.—A 3-ft. vein of which 14 in. is high-grade copper ore has been opened near the surface at the Honey Comb property at Ironton.—The Mono-Baltic Mining & Smelting Co. has let contracts for the grading and construction of its new smelter at Ironton. The contract for machinery and building material has also been let.—The shaft at the Legal Tender cut the sandstone at a depth of 132 ft. and is expected to open the Mineral Farm vein within 40 ft.—A 2-ft. vein of high-grade copper ore has been opened on the Kentucky Giant mine near Ironton by DeGolyer & Foreman, who are operating the property under lease.

SUMMIT COUNTY.

The Wellington Mines Co. has installed a Card concentrating table in its mill and a new electric locomotive between the mine and mill.—The new mill recently erected by Edward Jones at the Arctic mine is running regularly and the management is preparing to accept custom ores.

TELLER COUNTY.

Mathew Wilhelm has opened the southern extension of the Cookery vein on the Prince Albert company's property on Beacon hill. The ore was uncovered at a depth of 15 ft., and assays from \$18 to \$30 per ton.—A. B. Whitmore and associates have secured an 18 months' lease on the Anna May Wells property.—The Western Investment Co. has secured a lease on block 28 of the El Paso Consolidated Gold Mining Co.'s Little May mine.—The annual stockholder's meeting of the Trilby Mines Co. will be held in Cripple Creek, October 22. The company is producing 40 tons per day from the Trilby and Ben Harrison mines.—The Worcester ventilating system is being installed at the main shaft of the Raven & Beacon Hill Mining Co. The old shaft is down 500 ft., but no work has been done lately at that depth on account of the poor ventilation.—The Grace vein was opened by the cross-cut on the ninth level of the Rexal Gold Mining Co. It is 6 ft. wide and assays between \$20 and \$25 per ton.—A leasing company has been organized by Denver capitalists to develop the claims of the Phonolite Dyke Mining Co. on Signal hill. There are 50 acres in the group and four veins have been traced the entire length of the property.—A vein of ore assaying \$35

per ton was cut by the 25-ft. shaft at the Ida May property and a shipment has been made to one of the valley plants.—S. Sindlinger shipped two cars of \$40 ore from the 300-ft. level of the Lonaconing mine which he is operating under lease.

IDAHO.

BLAINE COUNTY.

The average of a number of samples taken from the vein on the Clipper group was \$5.77 gold with a trace of copper. The vein has been cut at a vertical depth of 700 ft. and there is an abundance of timber on the property.

IDAHO COUNTY.

Henry Hazlitt and George Trader are to install a 15-ton Huntington mill at their Oliva group near Dixie.—J. Bennett, of Whitebird, has purchased the Red Cross mine and will build a 250-ton reduction plant.—The framework of the new Penn-Dixie mill has been completed and the machinery will be installed in a short time.—Two new dredges have been completed in the Elk City district and will be in operation shortly.—The Eagle Mining Co. has begun grading for a Tremain steam-stamp, concentration, and cyanide mill at Edwardsburg. It is the first mill of this class in this district.

NEVADA.

CLARK COUNTY.

(Special Correspondence).—The cross-cut from the 1100-ft. level of the Quartette has intersected the main vein 400 ft. from the shaft. The mill is running steadily.—A 12-in. vein of milling ore has been cut on the 300-ft. level of the Pittsburg-Searchlight. Some fluorine was found, the first evidence of the mineral in this district.—The Crittenden Development Co. has started work at its lease on Duplex ground. It recently secured the New Year's Gift lease and is sinking from the 110-ft. level to the 500-ft. point, where a connection will be made with the Duplex incline shaft.—The Homestead has installed a compressor, and will sink the 600-ft. Fraction shaft to the 1000-ft. level. Searchlight, October 2.

The Eldorado-Occidental Mining Co. is to install a cyanide plant at its property between Searchlight and Hart.—A 50 h.p. Foos gas engine, compressor and two machine drills have been installed at the White Rock mine.—A cross-cut is being driven west from the 320-ft. level of the Lenape property and drifts run north and south on the vein. W. P. Spittal is manager.—A new surface plant is being installed at the Eureka-Searchlight property.

ESMERALDA COUNTY.

(Special Correspondence).—The Nevada-California Power Co., with four plants at Bishop, from which transmission lines now carry power to Goldfield, Tonopah, Silver Peak, Manhattan, Round Mountain, and other places, contemplate the building of a 100,000-volt line, with steel towers, from Bishop to Ely, a distance of 285 miles. The company's representatives are conferring with Ely operators, and the building of the line depends upon the success of negotiations with Ely people. The present equipment at the Bishop plant is equal to 18,000 hp., and, according to A. F. Dieter, the general manager, this will be increased to 20,000 hp. The demands for power on the part of mining men may be taken as evidence of an improvement in actual mine development in western counties of Nevada.—The Mona Power Co. is planning the installation of a 21,000-hp. hydroelectric power plant on Owens river, 15 miles from Bishop, and the building of transmission lines into Esmeralda and Nye counties. W. H. Leffingwell is chief engineer and manager.

Goldfield, October 4.

HUMBOLDT COUNTY.

(Special Correspondence).—Yellowstone, situated approximately 30 miles south of Winnemucca, is coming to the front as a gold camp. A large number of prospectors are in the district and several good ore-shoots are being prospected. On the Yellowstone claim a high-grade stringer is being opened and the ore sacked. J. C. Campbell is the owner.—On the Yellowstone Addition a 5-ft. vein has been opened at a depth of 25 ft., 6 in. of which are said to run \$200 per ton.—The Kindergarten, Florence, Fairview,

Wihuja and Tyler mines at Mazuma have been closed. L. A. Friedman the manager states that it is impossible to operate the mines profitably while paying the high scale demanded by the local Miners' Union. He further states that Mazuma will be an open camp or the mines will continue idle.—Owing to the inability of owners to interest capital in the mines, operations throughout the Seven Throughs section are practically at a standstill. Most of the properties seem to be fair prospects, but the orebodies are not of sufficient size or richness to attract interest from outsiders.

Winnemucca, October 2.

WHITE PINE COUNTY.

(Special Correspondence).—The Nevada Consolidated has commenced shipping ore from the rhyolite dike at the south end of the steam-shovel pit. Five steam-shovels are at work, two on the overburden, and three in the ore. The capacity of the pit is 6400 tons per day. The installation of the 300-hp. electric hoist at the Ruth workings has been practically completed.—The three-compartment shaft of Ely Central is down 75 ft. A second 40-hp. boiler has been installed.—The Cumberland-Ely still remains closed as a result of the strike of the miners. As the McGill concentrator is taxed to full capacity handling Nevada Consolidated ore the management is in no hurry to resume operations at the Cumberland-Ely.—It is reported that Nevada Consolidated will declare a substantial dividend before the close of the year.—The raising for the new shaft at Giroux Consolidated is progressing rapidly. It is nearly 600 ft. above the 1000-ft. level, where it was started. Some high-grade ore has been cut in the raise.—A new corporation, composed mainly of St. Paul capitalists, has been formed to take over the Gradelmeyer mines at Hamilton. These mines have been opened to a considerable extent, and with ample capital are expected to prove valuable producers. Harvey Hall will have charge of operations.—The fourth reverberatory furnace at the Steptoe smelter has been completed and the fifth will be commenced within a few days. The smelter is at present inadequate to handle the production of the concentrating plant, but within a few weeks it will be in a position to handle the full quantity of ore.—S. W. Eccles, president of the Nevada Northern railway, states that eight locomotives and 100 ore-cars will be added to the rolling stock of the company. This indicates that shipping will shortly start from the Ruth workings, and that the tonnage from the glory hole will be augmented.

Ely, October 4.

UTAH.

SALT LAKE COUNTY.

The 5000-ft. drainage adit at the Flagstaff mine at Alta has been completed. The adit is 300 ft. below the lowest of the old workings to which a raise was driven from the 4000-ft. point. The mine is credited with a production of \$9,000,000 in the '70's, but has lain idle on account of the heavy flow of water till the present company acquired the property.—The Emma Copper Co. has secured the necessary money to pay off its debts and has resumed operations.—The first unit of the mill of the Ohio Copper Co. at Lark will be completed by the end of this month and the company will be in a position to handle over 2000 tons of ore per day. New cars have been ordered for use in the Mascotte adit and a large tonnage is blocked out in the mine. When the mill is completed the company expects to mine and mill 4700 tons of ore per day.

SUMMIT COUNTY.

The Constellation and American Flag mines at Park City have been consolidated and a mill will be erected on the property, which now contains 350 acres of good mineral ground.—The shaft at the New York mine is down 875 ft. At the 1000-ft. level the company will cut a station and start cross-cutting. M. J. McGill is manager.—W. D. Lewis has secured a two-year extension of the lease on the Scott Hill property.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—There are three diamond-

drills running at the Le Roy mine.—The shaft on the Golden Rule claim is being sunk from the 35-ft. level. Recent assays of picked ore on this property have run as high as \$90 per ton gold, silver, and copper. Much of the ore, however, is low grade.—During July and August the output of the Trail smelter of the Consolidated Co. was \$985,000, or \$350,000 more than the output for the same months during 1908. An addition is being made to the lead refinery which will increase its capacity from 70 to 120 tons per day. There are now 240 working tanks in the plant and 180 more are being put in, which, with the settling tanks, will make a total of 596 in the building, which is to be 600 ft. long, with a traveling crane running the entire length.—Ten men are working at the Mollie Gibson group, Burnt Basin, which is under bond to a St. Paul syndicate. A large body of \$15 ore has been opened on the property.—The Portland Canal district is active. The second payment of \$18,500 has been made on the Red Cliffe bond. A plant is to be installed on the Portland Canal Mining Co. property, where a concentrator and tramway are now being erected.—Recent properties bonded include the Ajax, Ben Bolt, and McKay.

Rossland, October 1.

ONTARIO.

The cross-cut from the 200-ft. level of the Beaver mine in the Cobalt district opened a 9-in. vein of smaltite ore.—The vein on the 140-ft. level has been opened at a point where the ore assays from 2000 to 4000 oz. silver per ton.—The No. 10 vein was cut at a depth of 72 ft. at the La Rose mine. The ore is 3 in. wide and assays 4000 oz. silver per ton.—After a drift had been run 200 ft. on the 200-ft. level at the Shamrock an ore-shoot of native silver was opened.

MEXICO.

CHIHUAHUA.

The Yoquivo Development company has ordered a complete sectionalized 10-stamp mill for its mine. The ma-



Mexican Patio Process.

chinery is now being manufactured in Chicago by the Allis-Chalmers Co. and will be carried several days on mules after reaching the railway station nearest the mine. The stamps are designed for coarse crushing. The pulp, after concentration on Overstrom tables, will be ground in tubemills, agitated in tall tanks with air, and finally filtered on vacuum filters. Zinc dust precipitation is provided and is expected to be more economical than zinc shaving precipitation. All solutions are handled by triplex pumps and pulp is elevated but once, during filtration.

JALISCO.

The Cinco Minas in the Hostotipaquillo district is being equipped with \$20,000 worth of machinery to carry on development. Some high-grade ore has been shipped from the property by H. E. Crawford, who is in charge of the work.

Stockholders, representing 426,000 shares of stock in the Copper Range Mining Co., operating in the Autlan district, have brought suit to compel Charles D. DuBois, the president of the company, to account for the company's money and to prevent him from removing the machinery.

Special Correspondence.

GOLDFIELD, NEVADA.

Meeting of Mining Congress.—New Officers.—Work Resumed.

Goldfield is still talking about the meeting of the American Mining Congress held last week. The first session was called to order Monday afternoon at 2 o'clock by J. H. Hutchinson, chairman of the local committee, with about 300 delegates in attendance. Little business was transacted during the afternoon session, the time being consumed by the addresses of welcome delivered by C. S. Sprague and others. Responses were made by J. H. Richards, president of the Mining Congress, and by members of each State delegation. The most important detail of the day was the sending of telegrams by the Congress to President W. H. Taft and to Secretary of the Interior R. A. Ballinger, urging a Federal Bureau of Mines, co-ordinate with the Geological Survey.

In the evening the Mineral Palace was opened. Following this, exercises were held in the Hippodrome, where addresses were made by Milton M. Detch, George D. Pyne, J. E. Stubbs, and others.

The attendance at the second day's session was nearly double that of the first day, many of the delegates having arrived on a delayed train. The session was devoted to a discussion of silver and the means of increasing its use. Papers by C. C. Goodwin, James A. Heckman, and Thomas E. Kepner were presented.

A telegram was received from Secretary of the Interior R. A. Ballinger emphatically favoring the establishing of a Federal Bureau of Mines. Following the reading of the telegram were addresses by Francis G. Newlands, George A. Bartlett, and W. F. Englebright. All these addresses were on the subject of the Federal Bureau of Mines, and the sentiment of the Congress was evidently as strongly as ever in favor of the movement. Herman Zadig, of San Francisco, spoke on non-assessable mining shares, taking the stand that the incorporation of mining companies under the laws of States where the non-assessment plan prevails is mainly responsible for so many idle properties in Tonopah, Goldfield, and other Nevada camps.

In the evening there was a reception given at the Goldfield Hotel by the ladies of Goldfield to the members of the Congress and their wives. Short addresses were made by different members, and at the conclusion a banquet was served. Prior to the reception the president's annual address was delivered by J. H. Richards.

The third day's session of the Mining Congress was held at Tonopah, and the delegates spent a busy day taking in the mines and mills and attending to the business of the Congress. The various mining companies threw everything open and took particular pains to show and explain everything. At 3 o'clock the Montana Tonopah Mining Co. had its regular bi-monthly melt of the cyanide precipitate, and the refining room was crowded.

The business session of the Congress was called to order at 3:30 p. m. R. P. Dunlap, chairman of the entertainment committee, introduced the first speaker of the day, Hugh H. Brown, who made an eloquent address of welcome. Edmund B. Kirby, of St. Louis, Missouri, delivered an address on 'The Paralysis of the Mining Districts,' already published in the MINING AND SCIENTIFIC PRESS.

Mr. Kirby's remarks were listened to with attention, but it was evident that his views were not shared by a majority of the delegates. At the conclusion of his remarks, several took exception to his statements regarding assessment work, claiming that both prospectors and owners of ground performed the work in good faith.

'Mine Inspection' was then discussed. The papers on this subject appear elsewhere in this issue.

Peter J. Breen read an informing paper on 'National Mining Laws and their Meaning to the People'.

At 8 o'clock William C. Ralston spoke appropriately on 'Comstock Days'.

J. A. Saunders, of Tonopah, followed, and his tribute to the prospector was one that will be long remembered by

those present. H. R. Cook spoke at length on 'Sane Mining Laws', and in his address took issue with Mr. Ralston relative to the making of mining shares assessable.

The business portion of the meeting was closed by an address on 'Nye County', by Walter D. Cole.

The day's work having been completed the floor was cleared for dancing, and refreshments were served till 11 o'clock, the hour set for the departure of the train for Goldfield.

At the session Thursday the various standing and special committees made their reports. The committee on revision of the mining laws, through W. R. Ingalls, of New York, reported progress. A similar report was made by the committee on coal and taxation by Samuel A. Taylor, of Pittsburgh. The subject was further presented in a paper by G. W. Traer and an address by David Ross, of Springfield, Illinois.

A. D. Parker, of the Florence mine, spoke briefly but entertainingly. The talks of Douglas White, of the Las Vegas & Tonopah railway, and J. F. Kent, of Good Springs, Nevada, on 'Zinc Mining in Southern Nevada,' were postponed till the next session.

The annual election of directors was held Thursday night. The nominating committee consisted of S. A. Taylor, of Pennsylvania, R. L. Riepe, of Nevada, R. L. Herrick, of Colorado, J. A. Holmes, of Washington, and E. A. Carlson, of Idaho. They nominated D. W. Brunton, of Denver, Will L. Clark, of Jerome, Arizona, and George Wingfield, of Goldfield, as directors, and J. H. Richards, of Boise, as a permanent honorary director. They were all declared to be elected for two years.

Later the same evening the directors, consisting of E. R. Buckley, S. A. Taylor, George Wingfield, W. L. Clark, J. H. Richards, and John Dern, by proxy, met at the Goldfield Hotel and elected E. R. Buckley president, John Dern first vice-president, George W. E. Dorsey third vice-president, and John F. Callbreath, Jr., secretary.

Especial interest attached to the sessions on Friday, since various phases of public land problems were then considered. 'The Mining Man's Interest in Land Classification' was discussed by George Otis Smith, Director of the Geological Survey. This address is published on another page. The Forestry Committee of the Congress reported that several conferences had been held with the Forester and numerous difficulties had been adjusted. On one point, however, that relating to the use of timber for mining purposes taken from public land other than the claim upon which it was used, no agreement had been reached. The committee was of the opinion that the stand taken by the Forest Service was illegal, and strongly condemned the Chief Forester. The whole subject was discussed by W. W. Dyar, law officer of the Forest Service, and after further consideration the resolution of censure was defeated. Since the question of the legality of the action of the Forest Service is now before the courts, this action was evidently proper. It is understood that another committee will be named to formulate definite recommendations for change, to be made to the Forest Service and to Congress.

Saturday was devoted to visits to the mines and mills. In the afternoon a rock-drilling contest attracted much attention. The 'Malpais Mix-up' set for Saturday night was given up on account of rain.

Since the Congress adjourned, attention has been re-centered on local affairs. Meanwhile double shifts of miners are working in the caved area above the Hampton stope of the Combination in the effort to recover the bodies of the two remaining miners. The widely circulated story that Reese, whose body was recovered in a cross-cut at 130 ft. depth, was killed by fumes from the cyanide solution in the engulfed tanks, is characterized as ridiculous by J. H. Mackenzie. The solution was of but 0.1% strength, and the rescuing parties were working constantly in it without bad effect. The lower levels leading to the great stopes are being repaired and damage to the mine is slight. A force of men will be employed at once in clearing away the wrecked portion of the mill and in removing the plant in order to begin opening the orebodies immediately beneath. Production from the Combination mine will suffer but small

interruption, while the full capacity of the 100-stamp mill can readily be produced from the Mohawk and Red Top mines.

Production from the Clermont shaft has not yet begun. The comparatively small tonnage taken out in the course of development has shown gratifying value. From the 730-ft. level, where the west cross-cut toward the Mohawk entered the ore for over 250 ft., fifteen cars sent to the mill gave assays from mine sampling of 75.12 oz. and nine cars 91.12 oz. gold per ton. After this cross-cut, following the line of survey to the west, had been in ore of high quality for over 250 ft. the vein turned away to the south, and near this point ground was broken down on the north side of the lateral to provide room for starting a raise toward a point on the 600-ft. level, where rich ore is exposed. The first shots brought down high-grade ore, and a cross-cut was driven through 20 ft. of ore giving mine assays of \$500 to \$2400. As far as has been determined, this ore-shoot, for the entire distance followed, is from 12 to 25 ft. wide and is nearly all far above the established milling grade, with large quantities of exceedingly rich ore. Stopping at this level will begin at once with square-sets of the type used elsewhere in the mines.

SPOKANE, WASHINGTON.

A. I. M. E. at Butte, Anaconda, Mullan, Wallace, Wardner, Spokane, and Seattle.

The special party of members of the American Institute of Mining Engineers arrived at Spokane, September 27, after stops at Butte and Anaconda, Montana, and Wardner, Idaho. At Butte, September 24, the party was met by a local committee headed by B. H. Dunshee and C. W. Goodale. Sight-seeing cars were provided for a trip around the city, and a number of the visitors were taken down to the 1200-ft. level at the Leonard mine. A reception and dance at the Silver Bow Club closed the day and contributed to the visitors' pleasant impression of the city.

Anaconda was visited September 25. The party was met by F. W. C. Whyte, E. P. Mathewson, and William Wraith and shown through the great Washoe smelter. Luncheon at the Montana Hotel was followed by a visit to the Deer Lodge county fair, where display of grain, vegetables, and live-stock convinced the visitors at least that the oft-described 'smoke-devastated' farms of this region are misnamed.

The beautiful Bitter Root mountains between Missoula, Montana, and the Coeur d'Alene district were crossed early Sunday morning, September 26. Mullan, Idaho, was reached about 10 o'clock, and a visit was made to the Morning mine and mill of the Federal Mining & Smelting Co. Most of the time was spent underground, the mine being readily accessible by means of electric cars running through an adit 11,700 ft. long. Following this visit the train was taken to Wallace and side-tracked for the remainder of the day and night. The local committee, Frederick Burbidge, F. W. Watson, and J. F. McCarthy, had provided carriages, and a number of members of the party drove up Canyon creek to the Hecla and Hercules mines.

The first stop on Monday morning was at Wardner, famous as the home of the Bunker Hill & Sullivan mine and mill. Here the party was divided into three sections, the first visiting the mine, the second the mill, while the third, which was composed largely of the ladies, was conveyed by a special train over the 'high line', where the magnificent scenery of the district could be observed. The party which visited the mine, under the guidance of Stanly Easton, had a strenuous morning of it in climbing up and down stopes and man-ways in this, the greatest silver-lead producer in the world. It was nearly noon when the visit was completed, and shortly after that the train was again boarded and the trip to Harrison, on Coeur d'Alene lake, was made by 2 o'clock. The party then left the train and proceeded by steamer across the lake to Coeur d'Alene City, where a special trolley train was in waiting. A stop of nearly an hour was made at Post Falls, where the waters of the Spokane river, coming from Lake Coeur d'Alene, have been harnessed for the generation of 15,000 hp., which is dis-

tributed to the Coeur d'Alene district, and to Seattle, and also used for the operation of the trolley system.

The hour of arrival at Spokane was so late that the opening session of the Institute was postponed till 2 o'clock Tuesday afternoon. The hotels being crowded because of the visit of President Taft, most of the travelers remained on the train while in Spokane.

Tuesday was 'Taft Day', and the Institute met with a rival attraction. The local committee had provided seats for the visiting engineers on the grand-stand, and as no session was fixed for the morning, the members of the Institute had the privilege of reviewing the parade and of listening with interest and approval to the conservation address of the President.

The first session was called to order at the Masonic Temple, by E. J. Roberts, chairman of the local committee. Mr. Roberts introduced J. C. Ralston, City Engineer, who on behalf of the Mayor and of the Chamber of Commerce extended the welcome to the city. Dr. Raymond responded. The real business of the meeting began with the presidential address of David W. Brunton, on the 'Modern Progress



The Coeur d'Alene, Idaho.

in Mining and Metallurgy in the Western United States', already published in the MINING AND SCIENTIFIC PRESS. The paper brought out a lively and interesting discussion. William Kent, late of Syracuse, spoke on the debt the mining engineer owed to his mechanical brother for much of the improvements he has been able to introduce. To this Dr. Raymond responded that the mining engineer had to be not only a mining, but a civil, a mechanical, and an electrical engineer. He must combine the whole. W. S. Ayres, of Hazleton, Pennsylvania, spurred on by Dr. Raymond, gave a brief description of a dry coal washer brought out by him, in which frictional resistance and not specific gravity is the potent factor. Charles Catlett, of Staunton, Virginia, brought up the interesting subject of cost keeping in accurate detail, and W. O. Snelling, of the Technologic Branch, U. S. Geological Survey, told of the work of standardizing explosives. C. W. Goodale, of Great Falls, described the just completed dust-recovery flue and stack installed by the Boston & Montana Co. at a cost of over \$1,000,000, and E. Levy, of Rossland, British Columbia, told of recent improvements made in the mining operations in the Rio Tinto district of Spain. The discussion and the session was brought to a close by an eloquent address on the subject of

electricity versus compressed-air for mine haulage, by W. L. Saunders, president of the Ingersoll-Rand Company.

The evening session was opened with a second paper by Mr. Brunton on 'Modern Practice of Ore Sampling'. Mr. Brunton apologized for presenting two papers on the same day, the second being set for the evening because it was the only opportunity for a lantern illustrated paper. The paper was discussed by Thomas Kiddie, of Northport, Washington, who gave some interesting statistics on the results of sizing before sampling. The only other paper presented at this session was an abstract of one prepared by Franklin Bache, of Fort Smith, Arkansas, on 'Dust Explosions in Coal Mines'. The abstract was presented by the secretary, Dr. Raymond, who took the opportunity to emphasize in no uncertain terms the woeful lack of discipline in our coal mines, and held that the excessive use of powder—one of the most potent causes of coal-mine explosions—was due to the inequity and iniquity of the laws which compelled the payment for mining coal on the mine-run basis. He also incidentally took a fling at the anthracite strike commission as responsible for lax discipline in the anthracite mines of Pennsylvania and among railroad employees, particularly those known as the anthracite roads.

The meeting on Wednesday morning was a joint session of the A. I. M. E. and the Western Branch of the Canadian Mining Institute, and was presided over by the two presidents, Mr. Brunton and Mr. Thomas Kiddie. The first paper presented was by J. McD. Porter, of Spokane, on the 'Ruble Hydraulic Elevator'. It was discussed by Dr. Raymond and Mr. Kent, who also added by their suggestions to the interest of the second paper, a contribution of 'How We May Conserve Our Coal Resources', by Edward W. Parker, of the U. S. Geological Survey. The next paper was one on the 'Coal Resources of Alberta and Southeastern British Columbia', by E. Jacobs, secretary of the Western Branch of the Canadian Institute. Mr. Jacobs also presented an interesting communication on the 'Galt Coalfield of Alberta', by W. D. L. Hardie. This paper brought out some comments from W. S. Ayres. Milnor Roberts, of the University of Washington, Seattle, gave some extemporaneous remarks on the Nicola Valley coalfield of British Columbia, and the session and the Spokane meeting of the Institute was brought to a close by a general discussion of the papers presented during the morning, those participating in the discussion being W. Fleet Robinson, who also spoke on the 'Mineral Resources of Malcolm and Queen Charlotte Islands', and by Charles Catlett, Frederick Keffer, of Greenwood, British Columbia, Mr. Kiddie, Mr. Kent, Mr. Ayres, and others.

In the afternoon the members of the two Institutes were treated to automobile rides about the city and its picturesque suburbs, to the steam-power plant of the Washington Water Power Co., and to the mineral exhibit at the county fair grounds. The final and crowning feature of Spokane's hospitable entertainment of its guests was a brilliant banquet in the evening in the 'Hall of the Doges' of Davenport's restaurant. At the close of the banquet the members of the Eastern party resumed their accommodations in the special train, and about 7 o'clock on Thursday morning proceeded on their way to Seattle. An extra coach was attached to the train for the benefit of the local members and a few of the Canadian party who desired to take this portion of the trip.

The trip from Spokane to Seattle was without incident. The local committee, headed by Chester F. Lee, joined the party at the Washington Hotel. At Seattle, as at Spokane, the mining engineers were somewhat overshadowed by the presence in the city of the President. The morning was spent in a trolley ride on special cars to points of interest in the city, the thing of principal interest to the visitors being the wonderful re-grading of the city by 'hydraulic' away the hills. This is indeed a remarkable example of re-construction of a city. By noon the fair grounds were reached. They keep on schedule in Seattle. It should be remembered that the A.-Y.-P. Exposition was completed on schedule time, the first instance of the kind in the United States, and when it opened, the grounds and buildings had the same finished appearance they have today. An informal

reception and luncheon at the New York building gave the visitors an opportunity to meet the local members and their ladies. On Saturday morning automobiles were provided for a trip through the beautiful residence districts and along the great boulevards, and this afternoon, as the previous one, was left to the visitors to enjoy as they wished. Most of them spent their time in the exposition grounds. Sunday was without a special program, and to a somewhat fatigued party it was indeed a day of rest.

NEW YORK.

Cumberland-Ely.—Consolidation with Nevada Con.—Union Copper, North Carolina.—Davis-Daly.—La Rose Consolidated.

When the Cumberland-Ely company was organized to take over the Veteran mine and other claims at Ely, Nevada, several years ago, the active work of organization was done by W. B. Thompson and his associates, who secured the financial aid of the Guggenheim family of New York. The Guggenheims were not, however, the controlling factors in the company, and have not been until within the past few months. Recently Mr. Thompson is reported to have sold large blocks of Cumberland-Ely, which have passed into the hands of people closely identified with the Guggenheims. The long talked of consolidation of Nevada Consolidated and Cumberland-Ely is now believed to be near at hand, as Cumberland-Ely has fluctuated on the curb market during the past few days. After breaking through \$6 per share, it rose rapidly above \$7.

The Kerr Lake Mining Co. has made public its report for the year ended August 31. During that period the total sales of ore were \$1,382,290. This figure exceeded by \$592,977 the sales for the preceding year. It cost the company \$200,050 to make this production, or less than 8c. per ounce. The ore treated was 1072 tons. The production was 2,668,648 oz. silver. The average silver content per ton of ore was 2487 oz. The company's report sets forth that the cash on hand, together with the ore shipped but not settled for, is sufficient to pay dividends at the present rate for another year, and that the existing ore reserves insure the payment of like dividends for a number of years. One remarkable feature of the Kerr Lake report is that about 75% of the mining costs are shown as representing development and improvements.

A coterie of stock market operators is again manipulating Union Mines. Union Mines is the company which owns the old Union copper properties in North Carolina. The manipulation of Union copper on the New York Curb several years ago was a scandal of the first water. The stock was pushed above \$50 per share, and a large public was drawn to it during the manipulation. The properties of the company have never made any money for dividend account. Efforts, such as those being made, to again milk the public through the medium of a 'lame' stock should be stopped by the authorities.

The Tonopah Mining Co. has declared an extra dividend of 10c. per share in addition to the regular quarterly dividend of 25c. The annual meeting of the Davis Daly Co. has been postponed until October 15. Newman Erb sued for an injunction in Maine against the holding of the meeting on the day regularly set for it, and the Court granted him a stay. The Erb faction claims that it will hold proxies at the meeting to be held on the 15th, sufficient to enable it to oust F. Augustus Heinze and his friends from the directorate of the company. The La Rose Con. Mines Co. reports a remarkable showing on its Lawson properties at Cobalt as a result of the development since June 1. Four shafts are being sunk on the Lawson tract. Shaft No. 1 is on the 'silver sidewalk'. A cross-cut from the 88-ft. level of this shaft has picked up the vein, which is reported to be as strong at that point as on the surface, and has also discovered a blind vein which carries the solid high-grade ore characteristic of this part of the Cobalt camp. Shaft No. 2 has been sunk on what is called vein No. 2. This is a strong vein in the Keewatin formation. The other shafts are on veins No. 8 and No. 11, both in the conglomerate. Vein No. 11 is a comparatively recent discovery. This vein shows a width of 9 ft., remarkable for Cobalt, of which

something over 20 in. is high-grade ore, the balance being a good grade of concentrating ore.

In an interview, Mr. Frank Armstrong states for the company, that no attempt has been made to mine from any of the veins on the Lawson, but that by next spring the Lawson will be the largest producing property of the La Rose company.

BUTTE, MONTANA.

Amalgamated's Attitude Toward Production. — Development in Progress.—Pilot-Butte.—East Side Geology.—British Butte

Ben. B. Thayer, assistant to the president of the Amalgamated Copper Co., is in Butte making an inspection of the properties of the company. It has long been expected, in view of the unsatisfactory state of the copper market, that the Coalition increase would be ordered stopped, but no such order has yet been received. The fact that the Coalition company is permitted to increase its production gradually, taken with the fact that John D. Ryan, of the Amalgamated company, took a personal interest in the recent controversy between the miners' and engineers' unions, and succeeded in bringing about a speedy settlement of the difficulties, plainly indicates confidence in the copper market on the part of the Amalgamated officers. There was a general fear in Butte that the Amalgamated would take advantage of the fight between the unions to close the mines for six months or more, and thus solve the copper accumulation problem, but Mr. Ryan had no such idea, and the re-opening of the mines after the strike had continued three days best indicated his position toward the copper surplus. Mr. Thayer says that while the copper market is not altogether satisfactory, they are looking to the future with hope and confidence. General business conditions all over the world are improving, he says, and while betterment is slow, it is so certain and substantial that it can only be a question of time until every pound of surplus copper is taken and the productive powers of the mines will be taxed to meet the demands.

At the mines of some of the new producing companies production is being increased and a great amount of money is being spent in development. The Tuolumne is gradually adding to its production of ore, while it is developing several veins on the 1400-ft. level. The Butte & Superior company is continuing work, preparing for the erection of its zinc concentrator, with which it will treat 300 tons of ore per day. The Butte-Ballaklava company has nearly completed its big steel ore-bins and is opening four fine veins in its mine on 11 levels down to a depth of 1400 ft. The Pittsmont company (East Butte) is maintaining a good production, and is now operating at a good profit, earning about 70c. per share on its 300,000 shares of stock. With its enlarged concentrator and smelter the East Butte is in position to produce about 10,000,000 lb. of copper per year. East Butte copper costs a fraction more than 10c. per pound, very close to the average for the Butte district.

One of the new companies that finds pastime in holding meetings is the Pilot-Butte Copper Mining Co. The company owns a half interest in the Pilot claim, and \$70,000 is due on the remaining interest, in addition to which the company has other indebtedness amounting to \$85,000, which is secured by mortgage on the property. There is a shaft 530 ft. deep, and cross-cuts have been run on the 300 and 500-ft. levels a distance of about 600 ft. Recent developments in Clark's Elm Orlu mine, adjoining the Pilot, seem to warrant the conclusion that there is prospect of finding commercial ore in the Pilot at a depth of 1000 ft. In order to raise funds to carry on such development work the directors recommend an issue of first mortgage bonds on the property to the amount of \$375,000, payable in three years, and bearing 8% interest. They also propose to use the treasury-stock as a bonus to assist in placing the bonds. Part of the bond-issue is to be used in paying off the existing indebtedness, and the remainder to be used in providing a working fund. The Pilot is a small fraction of a claim, but it is well situated in the midst of producing mines. Recent discoveries of good ore in the Butte & Superior and Elm Orlu mines, which adjoin the Pilot, have

added greatly to the prospective value of the latter.

In the Murray-Switzer case, regarding the prospective value of east-side properties, John Gillie, general superintendent of the Amalgamated company, said that the company was not satisfied that the ground there was not valuable; he also said that the work of developing the Greenleaf mine would be resumed later. The Greenleaf shaft is down 1000 ft., but the veins were found badly broken at that depth, containing no commercial ore, and work was stopped during the 1907 panic. Gillie gave his opinion of several companies operating in that district and said he always considered that the Butte & London company had the least chance of any. In this he does not agree with H. V. Winchell, former geologist of the Amalgamated, who directed the operations of the Butte & London, and made reports on the property that were highly favorable. The Pittsmont company, now controlled by the East Butte, is the only one on the east side that is mining commercial ore.

At a special meeting of the British-Butte Mining Co. the stockholders voted to change the capitalization by reducing the number of shares from 5,000,000 at \$1 per share par, to 250,000 shares of the par value of \$20 per share. Old shares are exchangeable at 20 shares for one. The change was made for the purpose of giving the stock of the company a market standing, and to list it on the exchanges in London and Paris. After a shut-down of several weeks, due to trouble with the company's engineers, the dredge, operating west of Butte, has been started again. Some important changes were made in the tables, as the old ones lost too much gold. It is expected that the new ones will show much better results.

LONDON.

British Interest in Brazil. — Gold in Rio Grande do Sul. — Heawood Tin & Rubber Estate.—Tin Lode.

The gold deposits of Brazil have received more attention in England recently. One of the companies recently formed to conduct operations in that country is the Brazilian Gold-fields, Ltd., to which the firm André Griffiths, Mannheim & Co., act as engineers. The tract of country acquired is situated in the State of Rio Grande do Sul, 175 miles from the port of the same name. Mr. Mannheim has been on the property for some time, and has been developing an area immediately adjoining the mines of a Belgian company called the Société des Mines D'Or du Cerrito. His developments have proved the existence of payable ore, but the amount of work done is small, so that no idea of the extent of the deposits can be gained. The company, however, considers that it is justified in starting work with a 25-stamp mill. For the purpose of raising the necessary capital a subsidiary company, called the Brazilian Golden Hill, Ltd., has been registered with a capital of £150,000, of which £59,993 in shares, and £3500 in cash, go as purchase price to the parent company. The amount of working capital required is £40,000, and the issue of shares representing this amount has been underwritten.

Another new company introduced to the notice of the London public recently is the Heawood Tin & Rubber Estate, Ltd., which has been formed to acquire and develop the property of the Heawood Syndicate, in the State of Perak, Federated Malay States. The property is situated 21 miles from Ipoh, on the route from Singapore to Penang. At the present time there is a craze for rubber among company-promoters, and numerous companies formed for the purpose of exploiting forests in all parts of the world have been placed before the public recently. The Heawood company combines rubber and tin. The tin-ground consists of gravels which at present are worked on tribute. Part are said to be suitable for hydraulic working on a large scale, and it is estimated that £7000 will be required for the necessary equipment. At one part of the property an out-crop has been discovered, and already tin ore that sold for £11,600 has been extracted. Investigations are now being made to determine the prospective value of this lode. The information given in the prospectus is somewhat vague, and it is difficult to form any opinion as to the merits of the flotation.

MEXICO.**Santa Gertrudis.—New Plant.—Negotiation for La Blanca.—Guanajuato Development.—Pan American Railroad.**

The sale of the Santa Gertrudis mine, at Pachuca, State of Hidalgo, to Anglo-American interests principally represented by the Camp Bird, Ltd., is now an accomplished fact. The final meeting of the shareholders of the Santa Gertrudis was held at the Hacienda de Guadalupe, and the terms of the option given to Hugh Rose, were ratified by the vote of 45,572 shares out of 55,670 represented at the meeting. Out of the 60,000 shares of the company it was necessary to have 75%, or 45,000 votes, to make the ratification legal. The margin of 572 shares was, therefore, a very narrow one. The vote of 10,098 shares was opposed to the sale of the mine, but the very large interests held by the Landero family were sufficient to make up the necessary 75% and to decide the vote.

From September 13 to 28 the shares steadily rose from \$80 to \$127. The purchase price of the mine is \$9,000,000, or \$150 per share. It is stated that Hugh Rose, who was lately manager for the Guanajuato Development Co., will be manager of the mines for the new company. The work on the new cyanide plant being erected for the Santa Gertrudis Co. is being pushed vigorously. Newcomb & White are the contractors, and they have already received a large part of the material for the tanks. It is now on the grounds. The foundations are also ready. The riveting of the tanks will be done by compressed air, which will be supplied by an Ingersoll air-compressor. Everything is being done for the speedy completion of the plant.

The La Blanca mine, which was at one time supposed to have been definitely sold to the same parties, and which was afterward denied, is again in the lime-light. It is said that a group of English capitalists connected with El Oro mines are negotiating for the purchase of the mine for the sum of \$6,250,000, and that within 10 days the deal will be either completed or dropped. It is stated that the former deal fell through because the brokers asked a commission of \$900,000, and at that time the stockholders wanted \$6,000,000. If the deal is carried through, it will give added force to the influence and stimulus of the Santa Gertrudis deal on Mexican mining affairs.

The Real del Monte Co., of Pachuca, has taken up 150 pertenencias in the El Chico district, which will have a good effect on industry in that camp, and if this powerful company determines to push development at once it will be of great financial benefit to the district.

The Fortuna mines, near San Pedro Taviche, Oaxaca, are now owned by T. Carrabine, of Kansas City, the titles having been recently transferred.

Governor Obregon Gonzales in his message at the opening of the twenty-third session of the legislature of the State of Guanajuato gave an interesting review of the state of the mining industry of that famous district. He said the highest annual output during last century, was for the year 1850, during the bonanza period of La Luz, when the gross output reached \$8,510,177. At the end of the century the number of reduction plants in operation was 39, all using the patio process, and the average amount treated was 117,500 tons. Today there are 14 modern mills, with a total of 600 stamps, 12 tube-mills, and four Chilean mills, between them averaging over 2000 tons per day, the last years production having reached 746,425 tons, or over six times as much as a decade ago. The investment of foreign capital between 1903 and 1907 amounted to \$20,000,000. The value of the annual output has increased by leaps and bounds in the last few years. From 1905 to 1906 it was \$2,399,209; from 1906 to 1907 it rose to \$4,309,335; from 1907 to 1908 it reached \$7,385,455; and from 1908 to 1909 it passed the \$8,000,000 mark. During the coming year it is expected that the output will be \$9,000,000, or more. The gross production of the State of Guanajuato from 1893 to date has been close to \$93,000,000. The present weekly disbursement for wages and other local outlay is approximately \$100,000. Regarding the future, there is evidence that further large investments will be made. The Oro Grande Mines Co. has been organized by George W. Bryant with a capital of \$9,750,000,

and this company owns and will actively develop the groups known as La Luz, San Nicolás Tolentino, El Refugio, Melladito, and Bolanitos, which have all been famous in the past for their bonanzas. The Guanajuato Amalgamated Gold Mines will shortly invest further capital in the improvement and enlargement of plant, and the output of the mines will be correspondingly increased. The New York & Mexico Mines & Securities Co. has been organized by John Butler with a capital of \$500,000 to work the El Puertocito, El Carmen, Santa Virginia, El Pabellón, and El Patriarca. About \$7000 per month is being expended in preliminary development work. A Mexican company has also been organized under the name of La Compañía Minera de San Antonio Le Chispa y Anexas, for the purpose of exploring in depth for the veins of the famous old mines of La Luz. With this object in view the company is now engaged in sinking a deep shaft. The Republic Mines Co. is also investing further capital and is pushing development at the mines of Barranga and Anexas.

Adolfo Villar, of Torreón, has recently been in Mexico City making purchases to complete the material required for the erection of a 150-ton cyanide plant for the mines at Santa Maria del Oro, Durango. G. A. Denny has completed the sampling of the San Juan mine in the Taviche camp of Oaxaca. If the results of the examination are satisfactory it is understood that the mines will be taken over by an English company and developed on a large scale. Local mining men are, therefore, awaiting the outcome with keen interest, as the sale of this mine will mean much for the future of the camp.

The Tezuitlán Copper Mining & Smelting Co., owning the Ocotes mines in the State of Oaxaca, for some time past has done little else than block out ore, as the cost of transporting to the smelter at Tezuitlán was prohibitive, and the large percentage of silica in the ores made the problem of local treatment at the mines difficult. A solution of these problems must be in sight, judging by the active development now under way. The Ocotes is one of the most important copper mines in the State.

The purchase of the Pan American Railroad by U. S. Ambassador Thompson, has been published in the Mexican daily press as an accomplished fact, though Mr. Thompson states that the details of the arrangement are not yet completed. Work, however, is being rapidly pushed; 70,000 new ties have been ordered from California, and material to build steel bridges, and to repair the damage done in the recent floods; so that within a year it will probably be possible to travel in a Pullman car from Canada to Guatemala. E. M. Wise who has had many years experience in railroad work in southern Mexico is to be vice president and general manager. He is at present in charge of the active construction work. On the Guatemalan side there are still 25 miles of track to be completed, and there is a bridge 2000 ft. long to be built over the Suchiate river. As this river marks the boundary between Mexico and Guatemala, the permission of the Government of Guatemala has to be obtained. As soon as this has been done the construction of the bridge will be pushed as fast as possible. The Pan American Railroad is standard gauge; it starts from Gamboa, Oaxaca, on the Tehuantepec Railroad, and follows the Pacific coast of Mexico to the Guatemalan frontier, a distance of 458½ kilometers. The road traverses a low-lying tableland at the foot of the coast-range, and it runs about half way between the mountains and the sea. The country is tropical and subject to heavy rainfall. So far it is only very slightly developed, but there is said to be great opportunity for mining in the coast-range.

In the message of President Diaz at the opening of Congress, referring to the mining industry, it is stated that during the second half of the fiscal year, 2072 title deeds to mines were made out. Comparing the total number for the fiscal year 1908-1909 with the number in 1907-1908, there is seen to be a decrease of 36%, due in part to the financial crisis and to the low price of metals. Referring to railroads, it was stated that the total length of railroads subject to Federal control was 24,161 kilometers.

Action has been taken by a number of prominent mining men and engineers with regard to the project of mining law which is now before the Senate for ratification. It is claimed that proper provision has not been made with regard to large drainage-tunnel projects. A letter has been addressed to José Luis Requeña, president of the Chamber of Mines, which in part says: "I desire to call attention to the importance and necessity of taking such action as would cause favorable laws to be enacted by Congress, granting liberal benefits, privileges, and protection, such as would insure their construction whenever practical and necessary." There is a project on foot which is largely the motive for this action, and which involves the investment of over \$10,000,000 for the construction of a 12-mile drainage tunnel in the Pachuca district. The proposed amendments, are merely the revival of the provisions of the old law passed November 22, 1884, and repealed in 1892, which made it possible for a tunnel company to be granted a concession by the Government which would give it the right of way to tunnel through a designated mining district. The projected law does not give the Government the power to grant any such right unless the constructing company has the written permission of each individual mine owner, whose property might be affected by the work.

ROSSLAND, BRITISH COLUMBIA.

British Columbia Copper & New Dominion. — Output of Smelter. — Enterprise. — Rawhide Mine. — Granby. — Electric Zinc-Smelting.

The policy of the British Columbia Copper-New Dominion group is slowly but surely unfolding. It is now understood that an arrangement has been entered into for the ore from the New Dominion mines to be smelted and converted into blister copper at the plant of the British Columbia Copper Co. This action has been partly brought about by the influence the B. C. Copper Co. has wielded in view of recent heavy purchases of the securities of the New Dominion Co., but the fact that the New Dominion smelter at Boundary Falls is not well enough equipped to produce low-priced copper matte is probably the chief reason for this arrangement. There are times when corporations, like individuals, have to make the best of a bad state of affairs. This is what the New Dominion has to do today. The company has a big smelter to carry on its books, on which the interest on investment, depreciation, and other fixed charges are heavy; but to start work at the smelter under existing conditions would not decrease these charges; on the contrary, it would probably augment them, and in addition there would be a considerable loss on the ore treated, when compared with the rate that can be secured from the B. C. Copper Co., to whom the Dominion has always gone heretofore, to have its copper matte converted to blister copper. It thereby made a considerable saving in freight. The affairs of the new Dominion, as far as finances are concerned, are now in good form, and there is likelihood of an early start at the mines. The outstanding securities of the New Dominion Copper Co. will be about 250,000 shares of stock, of a par value of \$5, this being the entire capitalization of the Company, and, in addition thereto, there will be outstanding approximately \$500,000 in bonds. Owing to the interest which the B. C. Copper Co. has bought in the new concern it will have due representation on the directing board when the permanent officers are elected. Only a temporary directorate is now in charge of the company's affairs. At Vancouver last week the court granted the application of B. W. Lincoln for an examination of the books of the Dominion Copper Co. It will be remembered that Mr. Lincoln represents the dissenters in the ranks of the Dominion Copper shareholders. One of the provincial accounting firms is at present working on the books at the Company's mines. It is largely a matter of legal opinion as to what the outcome of the claims of the dissenters will be, and by the time the re-organization and amalgamation with the B. C. Copper Co. is completed it will cost as much to get at the live interests through legal channels as it would to buy up a new lot of mines.

Since the B. C. Copper Co. resumed in the early part of

August the plant has produced about 600,000 lb. of blister copper. The company is holding about a million and a half pounds of copper in anticipation of better prices. Some of the local mining men, however, do not expect to see much of a rise in the price of copper for some time to come, as the surplus stock is not being lowered to any great extent, and there are many big producers on the Continent ready to double their capacity whenever the demand shall warrant.

Last week the B. C. Copper Co. acquired three more mineral claims in Kamloops camp: the Irene, Sunset and Shamrock. The management of this concern is wisely providing for the future needs of the company, and has some promising plans which will entail the enlarging of mining and smelting operations at no late date.

On the Enterprise claim of the group being operated by the Con. Mining & Smelting Co. of Canada, at Rossland, a body of ore was pierced by the diamond drill at 100 ft. from the surface. Drilling will be continued on this property for some time, before a more permanent form of work is undertaken. The Consolidated Co. shipped 3840 tons of ore to the Trail smelter from the Centre Star group during the week ending September 18.

It is now announced that the British Columbia Copper Co. will build another furnace, 56 in. by 30 ft., at its Greenwood smelter. This will necessitate enlarging the present smelter-equipment from 2000 to 3000 tons per day capacity. The Oro Denoro mine, of the B. C. Copper Co., was again started last week with a crew of about 25 men. It is anticipated that the Emma mine of the B. C. Copper Co. will also be working again in a short while. The Rawhide mine of the Dominion Copper Co. will be the first of the company's properties opened, and it is likely that work will be started there early in October. The reserve in the Rawhide and Idaho mines of the company is placed at between two and three million tons, that should average \$1 gold, 18c. silver, and 22 lb. copper per ton. This ought to give a net recovery of 17 lb. copper, and \$1.15 gold and silver per ton. To make a profit of 40 or 50c. per ton, it will be necessary to keep the mining charges down to about \$1.12 per ton; smelting, \$1.25; converting, refining, and marketing, 46c., which, after deducting gold and silver will give approximately 10½c. copper.

JOHANNESBURG, TRANSVAAL.

Air Compressor Accidents. — G. A. Denny and Recent Metallurgical Progress. — Bantjes Consolidated Mill. — Geldenhuis Amalgamation. — A Rand Snowstorm. — Mine for Training Purposes. — Sand-Filter Tables.

The question of air compression automatically increases in importance when labor grows scarce and more work has to be thrown upon machine-drills. It has recently gained prominence through other causes. Although a year or two ago explosions and combustions in compressor plants were hardly known, there has lately been a remarkable succession of accidents of this description, sometimes resulting in fatalities from the gas evolved. The most serious accident occurred at the Langlaagte Deep in March last, and a complaint was made by A. C. Whittome, past president of the Institute of Mechanical Engineers, at the last meeting of that society, that the Government engineers had not yet issued any report upon the cause of the explosion. It would be of great service to the profession if all cases were independently investigated by the mining department's officials and recommendations issued—if not regulations—as a guide to the users of compressors. There is probably need for greater control over these, and it is probable that many of the accidents are the outcome of carelessness, of overtaxing the plant while paying insufficient attention to draining off oil-accumulations, to the condition of pipe-joints, and to the suitability of the oils used. The purity of the air at the outlets is a matter for further investigation, quite apart from the extreme cases of actual explosion. Men working in development faces and in back stopes are so largely dependent on compressor-air that death may be a result of bad conditions quite as surely as when there is a sudden discharge of CO into the mine from the combustion

of gases in the plant or pipes. The Mines Department is doing very sound work in investigation, but as urged by many, their enquiry would be of greater utility if reports were issued with promptitude. It is unsatisfactory to think that they may be awaiting further accidents to provide the data necessary for safe conclusions. Let some recommendations be made, even if only provisional. In its direct bearing upon Rand practice, the question of putting in pre-coolers is now being keenly debated by mechanical engineers. Opinions as to their use are divergent. Pre-coolers have lately been adopted by a certain mine in East Rand and success is claimed. Experiments conducted by one of the Messrs. Eckstein's engineering staff indicated that while he was able to reduce the temperature of the air at the intake from 70 to 51°F., the efficiency of the inter-coolers was reduced, and the final temperature was even higher than when drawing air direct from the open. This anomaly was due to the humidity of the air after its passage through the type of pre-cooler used, which is declared by some to have been of unsuitable design. However, there certainly exists a weighty prejudice against pre-cooling, owing to the increased humidity, which not only is detrimental to inter-cooling efficiency, but is harmful to the parts of the compressor and increases the risk of freezing at the exhaust. It seems certain that Rand engineers would be grateful to their American confrères if they would publish their experiences with pre-coolers, and thus indicate upon what lines progress has been made in other fields.

In the MINING AND SCIENTIFIC PRESS of June 26, G. A. Denny writes to the effect that the results of the work done upon the Rand by himself and his brother go unnoticed, and that their detractors are parading as innovations the ideas they expressed years ago; also that "all that has been done metallurgically upon the Rand of any consequence" since 1906 was forestalled by them long ago in methods publicly described. Mr. Denny may or may not have had good cause to object to the article entitled 'Rand Milling Practice', which apparently roused him to protest, but he certainly is unjustified in making claims of so sweeping a character as those contained in his letter. Let Mr. Denny rest assured that the daring experimental work undertaken under his control is well appreciated today, and that the untiring thoroughness with which he pushed his investigations and propounded the results for the benefit of the profession must always be recognized as admirable and exemplary. Perhaps, however, Rand engineers would be more ready to express their indebtedness to Mr. Denny for the leading part he played in the introduction of tube-mills from Western Australia, if he had omitted to make such an assertion as "In 1905 we installed, in the face of universal local opposition, fine-grinding (in tube-mills), agitation with cyanide solution and filtering." To suggest that the tube-mills were "introduced" in the face of universal opposition is misleading. If Mr. Denny perceived symptoms of this "universal" antagonism, it must have been of a rather "stagey" description, seeing that his tube-mills at the New Goch (working on concentrate, not coarse sand) started work some days later than that erected by J. R. Williams and his associates, W. K. Betty and S. H. Pearce, at the Glen Deep; nor were the metallurgists of the firms blind to the oft-discussed effectiveness of fine-grinding, nor slow to realize the practicability of its accomplishment by tube-mills. As for filter-pressing, this practice has been abandoned. There is no tendency to return to it, although vacuum filtration has its supporters. Mr. Denny's indirect claim to be the pioneer of heavy-stamp practice is unfortunately unjust to those who, by years of experiment and observation, have been responsible for stimulating the process of evolution by which we have now arrived at stamps of 1700 to 1800 lb., and even greater weights. He writes, "The 1600-lb. stamps, of which so much is heard lately, were introduced by us on the Rand in 1904." The natural conclusion to be drawn from such a statement is erroneous. The Messrs. Denny erected a battery of five Morison high-speed stamps on the Meyer & Charlton, but (1) they were not found a success, and (2) by no stretch of reasoning can the experiments with that type of stamp be considered to have led to or to have suggested the gradual increase in weight of the

gravity-stamp to its present figure. In a place like the Rand, where ideas are exchanged with such freedom often long before they are put to practical test, it is commonly difficult to apportion credit with perfect impartiality, but it may at least be stated with confidence that the Consolidated Goldfields can claim credit for the earlier development of heavy-stamp practice on the Rand (while the Albu firm, advised by Mr. Denny, took an insignificant part), just as the Albu & Eskstein engineers were principally responsible for the introduction of tube-mills. All these remarks may appear personal, and could be more fairly discussed over a signature than in these necessarily anonymous columns. The matter would not have been dealt with at all, however, had not Mr. Denny written with what seems extravagant force, claiming to have been the pioneer of all metallurgical progress on the Rand and to be the victim of some kind of vicious persecution at the hands of his "one-time detractors." It is regrettable that he should have attempted to throw a discreditable light upon the work of his former friends and foes on the Rand (still speaking technically, for the attitude of financial heads has no bearing upon the points at issue), and that the principles governing the controversies in which he took so keen a part some years ago should have been neglected.

A great deal of importance has been rightly attached to the results of development in the Bantjes Consolidated, which is a large property in one of the least explored portions of the Rand. Work was re-started there last year and a small mill of 10,000 tons monthly capacity was erected. Results have clearly been satisfactory, for the plant is to be doubled forthwith, and this duplication is probably only a further step in the advance toward the larger-scale unit which should be the final aim in the expressed opinion of the consulting engineer. Another mine amalgamation, on a more modest scale than usual, is to be carried out in the near East Rand. The participating companies are the Geldenhuis Deep, Geldenhuis Estate, and Jumpers Deep, the first-named being the absorbing concern. The crushing capacity of the three mines is 74,000 tons daily, to be raised on amalgamation to 80,000 tons, and their joint ore reserves 2,122,000 tons, of an average value of 5.9 dwt. As compared with the Crown Mines, East Rand Proprietary, and Randfontein South, this is a small and low-grade combination. The Geldenhuis Estate has been a high-grade mine in its day, but it has lately been dealing with ore yielding only a little over \$5 per ton.

A few months ago it was my duty to record in these columns the unparalleled rainfall and floods in January, which were the cause of a heavy loss of life and money. The Rand has again been visited by what the writers in the daily press are proud to call an "unprecedented phenomenon." On August 24 there was experienced the first heavy snowstorm known for 19 years. About a foot of snow fell during the day. The consequent damage or inconvenience to the mines was not heavy, being principally witnessed in the breaking down of telephone lines and trees, and the temporary obstruction of some surface transportation lines. Had the snowstorm lasted longer, the results would have been serious owing to obstruction of the tailing-discharge service.

The Government, acting in co-operation with the Chamber of Mines, is still on the lookout for a 'State mine', suitable as a training school for miners. At the moment the possibilities of the old York mine at Krugersdorp are being investigated in this connection. This small property is being worked at present by Abe Bailey.

At the last meeting of the Chemical, Metallurgical & Mining Society, W. A. Caldecott read a paper on sand-filter tables, which he has successfully introduced at the Simmer Deep and elsewhere. A rough sketch of this plant, which is essentially a sand collector (producing a good granular leaching product) and not a slime-filter, as commonly understood, and erroneously given in the MINING AND SCIENTIFIC PRESS of July 10. Ample evidence has been brought forward to demonstrate the great saving in initial expenditure, as compared with the ordinary system of sand-collection in vats, the slightly better and more rapid extraction, the low current costs, and the practical reliability of the scheme.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Slime.

The Editor:

Sir—As an index of the general acceptance by metallurgists, of the value of 'sliming' gold and silver ores it is noted that Alfred James in his review of the progress of cyanidation for 1908, states that it was reported that some 5,000,000 tons of slime were treated by vacuum-filters during the year. It is but a very few years ago that slime was treated as a necessary nuisance to be disposed of as efficiently as possible, and efforts were largely directed toward seeking means to secure the crushing of ore in such a manner as to produce a minimum of slime, but the realization of the fact that in many ores the gold and silver were in an exceedingly fine state of division, and that fine grinding liberated more completely the minute particles in a form particularly suited to the action of the cyanide solution, led to a large adoption of the 'sliming' treatment, converting what had been heretofore an undesirable by-product into the chief form of output. The transformation of method was greatly stimulated by the means that were developed both for producing slime and handling it, the former aiding materially in the attack of the solution on the metal-content of the ore.

In crushing rock it is broken into fragments of varying sizes down to impalpable powder which settles but slowly, even in still air. Both the physical and chemical characteristics are usually complex, and it seems, so far as results are concerned, that an exact definition of the term 'slime' is not necessary beyond a determination of its susceptibility to ready treatment by the solution. Usually this fine product in any considerable mass is impermeable, and hence should be treated in detail, so to speak, in a manner so that each particle may be brought into sufficient contact with the solution. This is brought about in present practice by agitation in tanks provided with means for mechanical or air agitation, requiring a number of hours for the purpose, and afterwards allowing a partial settlement to take place, following by the decantation of a portion of the solution before turning the pulp into the filters, all of which requires a large tank-capacity and the consumption of much time.

There is probably no better condition in which the pulp could be placed after it has left the tube-mill, or other pulverizing machine, for the extraction of the metals than its course through the launders, where, in a comparatively thin stream, it is subject to agitation, aeration, and the attrition of the particles against each other and the launder, all aiding in the solution of the metal. It is worthy of consideration whether a sufficient extension of the launder system, aided by some pumping facilities to supply defects in fall, might not be an economy in space, time, and tank-equipment, and produce better results. It is interesting to note, in this connection,

that in the method recently introduced in the Simmer Deep and the Jupiter joint mill in the Transvaal, as briefly described in the MINING AND SCIENTIFIC PRESS of July 10 last, the de-watered sand which is washed by a 0.3% solution from the filter-tables to the collector vats has 50% of its gold dissolved in the passage.

Two general types of vacuum-filter have been developed for the purpose of handling the slime after the extraction has been completed, although there are many varieties of these. One of them is dependent upon the accumulation on the filter surface of a cake of the solid portion of the pulp by means of suction in opposition to gravity, and the final disposition of the cake by dropping it through the medium of gravity, assisted by a reversal of the pressure previously applied, and by more or less scraping. In this type the homogeneous character of the cake is an element of great importance, for on it depends the successful washing, and great care is necessary in transferring from the pulp to the wash-water so that the cake be not too much dried, which tends to produce cracking, thus reducing the efficiency of the washing. While in this type of filter it is possible to present a very large filter-surface in a small floor-space, great care is necessary in the accumulation of the cake, which accumulation seems to be facilitated by the use of a thickened pulp in which any tendency to the settlement of the heavier solids is retarded by the thickened condition of the mass, otherwise, in the height of the leaves of the filter, there would be a decided difference in the density of the cake at the top and bottom. An interesting difference appears to exist between the basket-type of filter and the Ridgway form, consisting of the small horizontal filter-frame which is dipped first into the pulp, and which rapidly accumulates a cake about $\frac{3}{8}$ in. thick, then automatically dips the cake into the wash-water and afterwards dumps it by a reversal of pressure. The basket-filter exposes from 50 to 75 sq. ft. of surface per ton of daily capacity, while the surface of the Ridgway exposes from 1 to 2 sq. ft. The former receives its charge of 1 in. in 30 to 60 minutes; the latter accumulates $\frac{3}{8}$ in. in 13 seconds; or assuming the 50 ft. exposure and the 30 minutes time in the one case, and the 1 ft. exposure and the 13 seconds time in the other, this would result in 144 cu. in. per square foot in 30 minutes in the one case, and 7452 cu. in. in the same time in the other. These figures are not cited as absolutely representing the relative merits of the two forms of filter, although such have been reported as their accomplishments. They serve to indicate, however, a great difference in point of time in the accumulation of a thick and thin cake under the respective conditions, and further point to a possible advantage in the attack in detail instead of in masses. The basket type of filter might be denominated 'the adhesion type', from the method of accumulation and of holding the cake as distinguished from the other type to which I have referred, in which the accumulation of the cake is accomplished by a vacuum, aided by gravity, and its final disposal by mechanical means. In the latter type the thickness and uniformity of the cake are not matters of

such prime importance: the chief aim is the separation of the filtered solution from the solids, in the accomplishment of which there is a vastly greater latitude with respect to the condition of the cake than in the former, in which the homogeneity of the cake is an essential to the successful operation.

This type embraces the horizontally revolving filters, and differs in principle from the other mainly in the reversal of the application of the force of gravity. It might be denominated as the 'upright' or direct method of filtering in contra-distinction to the 'adhesion' system. By dealing with smaller quantities at a time, and presenting cleaned surfaces to the pulp, it participates in the advantages of the attack in detail, if such there be. It results in a very simple device, automatic in operation, and in which the cake is in full view at all times; it is equally applicable to coarse or fine material or both together; in fact, in particularly impermeable material the addition of sand would considerably aid the filtration; nor does the particular character of the cake injuriously affect the washing which is not accomplished by flooding or submersion. Just sufficient water is used to thoroughly wash out the remaining valuable solution, all of which is retained, and there is no liability to loss from osmosis. The wash-water is applied uniformly over the cake in small quantities, and is drawn through at the point of its application and may be applied at different points of the cycle in such a number of successive applications as may be desirable. With the numerous successful means of handling slime, the two general types of which I have endeavored to briefly review here in so far as they include the vacuum-filters, the early slime bug-bear to the cyanide man has been quite thoroughly eliminated, and the problem has been relegated to the pulverizing-device for determination as to how far the fine-grinding may be profitably carried.

EDWARD PARRISH.

Newport, Rhode Island, September 21.

Continuous Sand-Filters.

The Editor:

Sir—In your issue of July 10 you refer to a continuous revolving filter for slime as being applied to the Rand mills by W. A. Caldecott, the same being introduced into American practice by Bertram Hunt a year ago. In justice to Mr. Caldecott I wish to point out that his device is a sand-filter and not a slime-filter. Mr. Caldecott had a 10 ft. diam. sand-filter running successfully at the Knights Deep, Limited, in the early part of 1907, before he visited the United States, and a year before Mr. Hunt's filter started.

Though a correct description and photograph are given on p. 48 of the MINING AND SCIENTIFIC PRESS of July 10, you were doubtless misled by the fact that many slime-filters exist, while, so far as I am aware, Mr. Caldecott's filters are the only existing sand-filters with continuous discharge in regular use, their introduction being a new departure in metallurgical practice. The development to date of the rotary vacuum sand-filter tables, and the extent to which they are now in regular use is fully described

in a paper read before the Chemical, Metallurgical and Mining Society of South Africa, on August 21, 1909. All the sand produced by the Simmer Deep, Ltd., stamp-mill, which crushed last month 75,000 tons of ore, has been continuously and satisfactorily handled for several months by two 20-ft. sand-filters, and a great saving has thus been effected in the number of sand-vats otherwise required. I hope you will correct the impression your editorial has given.

F. C. FREY.

Germiston, Transvaal, August 30.

Excess Ground in Mining Claims.

The Editor:

Sir—In the issue of the MINING AND SCIENTIFIC PRESS of September 25, 1909, at the bottom of the first column, page 425, is the following item: "A mining location which exceeds the maximum limit is void only as to the excess, unless fraud is shown. The locator has the right of selection of the ground to be retained, even as against an overlapping locator."

The first sentence states the law as it is. The second sentence may not be the true rule. I do not care to trouble you, but if you have the authority for the second sentence handy, I would like to have it. This very question was in issue recently in a trial in Goldfield, and my recollection is that Judge Stevens held the other way, namely, that the locator in casting off the excess must be guided by the middle line of his claim, one determining point of which is his location monument, or his point of discovery. I refer here, of course, to an excess in width; the rule is correct as to an excess in length.

MARK R. AVERILL.

Tonopah, Nevada, September 28.

[The item you refer to is correct as the statement of a general rule, but like all condensed and categorical statements of a similar character, is subject to qualification. It was intended to include both placer and lode claims. Of course, it is unnecessary to state that the locator of an excessive location could not elect to cast off a vital part of his claim, such as his discovery, or his discovery shaft where the latter is required by State law, without running the risk of invalidating his entire claim. Nor could a lode locator safely exclude from his claim such an essential part of the claim as the apex of his discovery vein nor could he include territory which the law would not authorize in the first instance. The point you raise about casting off or retaining an excessive width should be determined by the general test—would it have been lawful in the first instance to have included that particular piece of territory in the location?—if so, the locator of the excessive location may usually elect to retain it, otherwise he may not. For example, if a locator staked out a claim of excessive width with 350 ft. on one side of his lode and 300 ft. on the other, he could not elect from which side he would cast off the excessive width, for it was not lawful for him to have included more than 300 ft. on either side of his lode in the first instance. This question of excessive width of a lode location is admirably treated by Costigan in his recent work on Mining Law, pp. 199-204.—EDITOR].

THE MONTEREY FLOOD AND SAN LUISITO BRIDGE.

Written for the MINING AND SCIENTIFIC PRESS
By SAMUEL J. LEWIS.

During the night of August 27 last, a disastrous flood occurred in the Santa Catarina river in the State of Nuevo Leon, Mexico. The city chiefly affected is Monterey, which has a population of about 85,000. Not less than 3000 persons were drowned in the city alone, exclusive of the heavy death-toll lower down the river: the property-loss runs into the millions. Benito Juarez street, the principal north and south thoroughfare, crosses the river at right angles at the south side of the city, the district on the other side of the river being known as the Barrio San Luisito, and the bridge as the San Luisito bridge. This structure was completed in 1908. It is of reinforced concrete throughout; and consists of a covered foot and cartway, flanked on both sides by small shops. It is supported on three piers: one in

measurements with floats on September 8, flowing about 900 cu. ft. per second.

On arriving at the bridge, which by its shape and small clearance for water practically dammed the channel except for very small flows, the velocity of the flood was temporarily checked, causing rapid deposit of sand and gravel brought down by the torrent. The extent of this deposition may be studied by comparing the illustrations. The 'wash' practically filled the old channel. The ground at the left in Fig. 2 is the San Luisito district, the view looking west toward Mitra mountain in the distance. The other view, Fig. 3, shows the bridge today, with the space between the piers completely filled with gravel above the spring of the arches. This deposition must have occurred very fast, as the waters, arrested by the solid bulk of the bridge, piled themselves up against it to a frightful height, the arches merely acting as culverts of rapidly diminishing cross-section. Only under high velocity could the river move such heavy gravel, and the moment the reduction in

velocity took place, the gravel had to come down. Under the terrific pressure, the water coming through the arches carried a heavy load of gravel down stream for some 200 ft. below the bridge. Meanwhile, however, as the pressure against the structure increased, one of two things had to happen; either the bridge had to go, or the river had to find itself a new channel. The latter it had begun to do under the same conditions on August 10 during the severe storm of that date, when a destructive body of water came down river in what was then spoken of as a great flood. On the present occasion, with the bridge well and solidly



Fig. 1. Map of Monterey District.

the centre of what was then the channel: the other two at the abutments. This gives two 70-ft. spans, springing in low flat arches, about 7 ft. high at the crown. The height from the river bed to the spring of the arches was about 7 ft. also. Reference to the illustrations will make clear the form of the structure. It is only necessary to add that both sides of the stream were thickly built up as far down into the bed of the water-course as individual opinion thought consistent with safety. It should be remembered, also, that this stream is absolutely dry for 350 days in the year, nine years out of ten.

Twelve hours before the storm the river was dry; as the rain continued Friday evening, the water began to rise rapidly, the heavy storm of August 10 having brought the water-table up close to the surface. At about 9 o'clock in the evening of August 27, apparently in a brief interval, the water arrived at the upper limits of the city, running breast-high, at high velocity, and sweeping all before it. The maximum then attained was kept up with but slight fluctuations until a little after 9 o'clock the next morning. It then began to fall, and was, by my

tied to three reinforced concrete piers sunk 25 ft. below the old surface of the gravel, the energy developed proved inadequate to move it. The river presently tore out the soil at the north end, taking part of the abutment with it. On account of the ground being high on that side, however, but little of the water could get away. At the south end, the only high ground was that at the abutment, partly built up, to meet the grade-line of the bridge; the rest was low, gently sloping up from the channel. The mass of water, unable to get past the bridge, cut its way through the soft soil at the south end; the abutment walls were of re-inforced concrete about 2 ft. thick, built with smooth rods, and the ends not upset, nor with any other provision against slipping. The rest of the abutment was 'dry-fill' of heavy gravel from the river bed. As the soil was cut out, taking with it some of this loose fill, the abutment walls had to take the full strain, and failed by the pulling out of the rods. This is shown in Fig 4, where the rods are seen to have come out clean. The abutment became a total wreck, everything giving way right up to the pier, where the arch is tied

in. The arches themselves were not seriously damaged, beyond cracking along the top throughout their whole length. The superstructure was punched full of holes by drift-wood, which filled the interior.

The foregoing description of the bare facts shows that the discharge-area of the arches was not adequate to carry off even a small fraction of the flood-

from this that the question of how much the stream might have to carry off could not have entered into the design of the bridge.

A study of the drainage area of the stream, as shown by the map, Fig. 1, reveals that the Santa Catarina drains approximately two million acres above Monterey. The map, copied from the excellent official production prepared under the direction of the Governor of the State, Bernardo Reyes, shows a rugged mountain country in which the main canyon seldom exceeds a mile in width, with innumerable tributary gulches of much narrower channel. The main river valley is almost solidly walled in by mountains, which, in a mile or two of horizontal distance seldom rise less than 3000 ft. to the crest, and frequently more; all this being absolutely bare limestone rock. The only soil and vegetation, capable of retaining water, are found in the bottoms, and such



Fig. 2 & 3. San Luisito Bridge. During Construction and After Flood.

flow that might reasonably be expected in a stream of this character, and it is my opinion that a large proportion of the damage and loss of life was directly due to the presence of the structure in the river bed. Had the channel been clear, the waters would probably have caused destruction on both sides to a

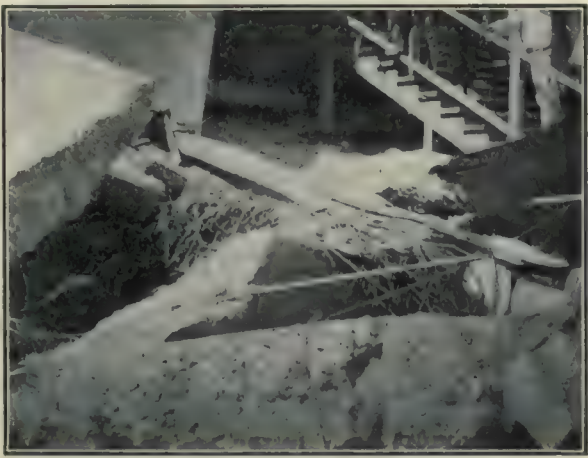


Fig. 4. Rods Drawn From Concrete Abutment.

ground is probably less than 10% of the total area. As to the grade from Monterey to the Obispado, a distance of over a mile, it averages 1%; from there to the village of Santa Catarina, 1½%; from there to Nogales, 3; and from that point on up the canyon the grade gets steeper to the various crests of the di-

vides. With the soil bearing so small a proportion to the total area, and well soaked up from previous rains; with every feature of the topography favoring very rapid run-off, it seems clear that a maximum proportion of the total precipitation, amounting to not less than 50%, and probably to much more, should be expected to arrive at the bridge site in a brief period. The foregoing facts as to the coming of the flood show that the maximum remained constant for 12 hours. Now, official and private observations of the precipitation of August 27 coincide in

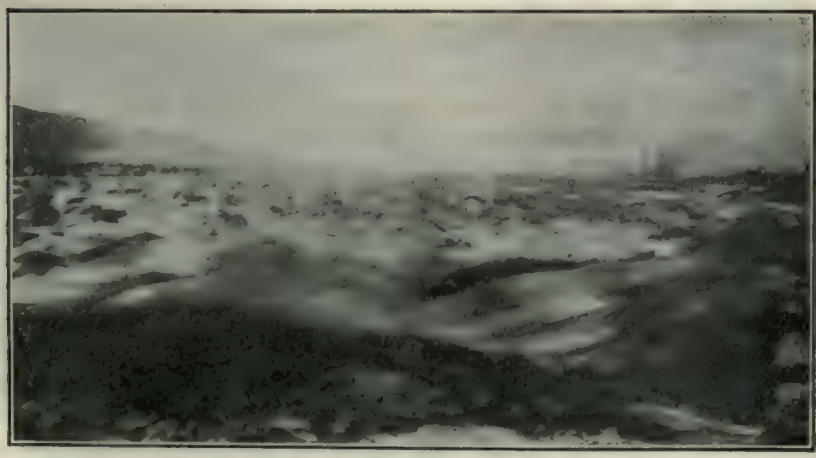


Fig. 5. Santa Catarina River at Monterey in Flood.

greater or less extent as it rose, but the grade is so steep in the water-course that very large bodies of water would be rapidly carried off. With the banking up of the stream some 10 ft. higher than the piers, the whole valley for more than a half mile up-stream has filled, encroaching on ground that otherwise would have remained unharmed. It will be clear

making it 22 in., of which about 15 fell during the 12 hours of flood. If the rainfall be taken as 1 inch per hour, and 50% of the precipitation over the whole area be assumed as arriving at any stated moment during the flood, there results one inch over two million acres, or roughly, 150,000 acre-feet of discharge; of which 50% gives 75,000 acre-feet per

hour, or 20 acre-feet per second; this means about 800,000 cu. ft. per second. If even 10% of this quantity, or 80,000 cu. ft. per second, could by any possibility reach the bridge at one time, it should obviously be so designed as to carry off the whole of the discharge with a minimum of obstruction. The velocity of the surface of the stream during the flood was estimated by experienced engineers to be about 30 ft. per second. As the velocity of the comparatively insignificant thread of water now remaining is 7 ft. per second, this estimate seems not unreasonable. Taking the measurements above given of the bridge clearance, two areas 70 by 7 ft. are obtained, and two areas each $\frac{2}{3}$ (70×7); a total of 1632 sq. ft. At a velocity of 30 ft. per second at the surface, the available channel under favorable conditions could carry 49,000 cu. ft. per second. Comparison of these figures with the possibilities of the drainage area show at once how totally inadequate such a channel must have been. Doubtless a thorough study of the topography might modify these statements to some extent, but even from the foregoing hastily prepared data it is clear that the design of this bridge did not take into account to any appreciable extent the drainage problem of which it should have been the solution. Even the angle the structure makes with the current is such as to favor deposition. If it had been a right angle, there might have been a possibility of scouring with the velocity developed, which, perhaps, would have helped; with the 15 degrees or so of deflection, the conditions were most favorable for deposition of material carried in suspension. Finally, if any reader be skeptical as to the enormous discrepancy between the figures above developed and the actual capacity of the bridge, his attention is invited to the illustration, Fig. 5. This shows the river at flood, with the bridge barely distinguishable at the right of the picture. The fact speaks for itself.

From an engineering point of view, it is not of great importance that this storm was of most unusual severity; the important thing in design would be that the drainage area served by the river is capable, because of its extent, of receiving easily calculated quantities of rainfall, and of delivering them past a certain point at calculable intervals of time. These points should have been the first determined in the design of the structure, and failing satisfactory information on that score, the ethics of engineering would seem to indicate refusal to do the work. As it was, the thing was a purely commercial proposition, worked out without the supervision of a hydraulic engineer, and the results were disastrous.

Copper ore shows an increase in imports of nearly 50%, 36½ million pounds having been imported in the seven months of 1909, against 25½ millions in the same months of 1908; and copper pigs, ingots, etc., show an increase of 96%, 138¾ million pounds having been imported in the seven months of 1909, against 71 millions in the same months of last year.

Imports of pig tin show an increase of nearly 25% during the current year, the quantity imported in the 7 months ending with July being 56 million pounds, against 45½ millions in the corresponding period of 1908.

UNDERGROUND WATERS IN SEMI-ARID REGIONS.

By W. C. MENDENHALL.

*Many gravel-filled valleys west of the Rocky Mountains contain both surface and underground waters, not enough of either alone to irrigate all of the tillable lands, but when both are used together are much more valuable than when either is used alone. Often power can be developed upon surface streams and this power applied to the recovery of the earth-waters that saturate the lower valley-lands. This mountain water coming down to the lands from above is made to lift the underground water to the lands from below; a most admirable combination, and one excellently illustrated in the case of the Santa Ana river in southern California. A part of the water of this river is stored in a reservoir in the San Bernardino mountains, and the flow of the stream thereby regulated. After it escapes from the reservoir it is diverted through a power-plant and electric power is generated. Below the first power-plant it is re-diverted and passed through a second power-plant. Below this it is all distributed and used for municipal and irrigation purposes about Redlands and Highlands. The waters that return from the irrigation are recovered in springs and flowing wells and by pumping plants, a portion of the power developed higher up on the stream being used for the latter purpose. This recovered water is used for irrigation about San Bernardino and Riverside. A part of it re-appears in the river above Riverside Narrows, where it is again taken out into a power-ditch, the waters being returned to the river above Corona. A few miles below it is picked up by canals and distributed to the orange and deciduous groves about Anaheim and Santa Ana. The portion of it that returns there, by irrigation, to the ground-water is once more recovered by the many pumping plants and flowing wells west of Santa Ana in the lower coastal plain. A single drop of water in its progress from the mountains to the sea, a distance of only 100 miles, may thus be used as many as eight times for power and irrigation. This is an almost ideal use of water. The combination of power-development and the recovery of underground waters to supplement the surface-flow results in a minimum of waste and a maximum of economy. Development of this type is being rapidly extended now over parts of the West and will receive still further extension in the future. But care must always be taken not to tax too severely the underground basins from which the water is drawn. They are not by any means inexhaustible. When rainfall is light, the quantity of water returned to the reservoir each year may be small, although the quantity stored there is large. However large it may be, if more is withdrawn each year than is replaced, there will be a gradual lowering of the ground-water level and ultimate disaster. Therefore, users of ground-waters in arid regions must study carefully the effects of development in order to be sure that they are not prospering during the present at the expense of disaster in the future. Furthermore, in many sections where water is badly needed ground-waters do not exist.

*Abstract from U. S. Geol. Surv. Water-Supply Paper 234.

MINE INSPECTION.

By COURTENAY DE KALB.

*Mine inspection in the United States has been generally neglected except where the dangers of coal mining have forced legislatures to devote attention to proper police regulation. The tendency is always strong to avoid Governmental interference with private enterprise and the influence of mine owners has usually been stronger than that of the mine operatives, hence small headway has been made in providing protective measures. Moreover our peculiar form of government has rendered such action more difficult. Mine regulation in foreign countries is established by the central government but the Congress of the United States has no power to enact police regulations which shall apply to the separate States. Under such conditions it is more difficult to arouse public sentiment favoring measures which limit the freedom of individuals. The growth of the mining industry, however, by increasing the number of laborers employed in such operations, has aroused interest in this matter to a degree formerly unknown. The result has been the passage of Acts by several States, the chief characteristic of which has been their inadequacy and their dissimilarity. It is of great importance that uniformity in mine inspection should exist, in order that our shifting population of miners and mine owners may always be familiar with the regulations to which they must conform, otherwise confusion will result, and errors which may prove fraught with peril will necessarily be made by those having the lives of their fellow men under their charge. The passage of laws for police regulation of mines by separate States should be discouraged at the present moment until some means has been found for bringing about co-operation between them in the enactment of similar statutes. Conditions may necessitate variation in minor matters, but with regard to mechanical matters which are common to all mines, and upon which safety to operatives so largely depends, there should be no divergence. It would seem desirable to take such steps as will lead to the enactment of a Federal statute which should be based upon such careful study of conditions at home and abroad as would serve as a safe model for all States to follow. A Federal statute would, of course, apply to the territories and to Alaska. By this means the United States Government, without interfering with State sovereignty, can blaze the way and render a permanent service to the country at large. The purpose of mine inspection should be strictly and solely that of police regulation, the object of which must necessarily be the preservation of life, health and property. An essential feature of any police regulation is that it shall apply as a universal principle, and not in any respect discriminate between classes and industries. A regulation may be made to apply to a specific industry where the purpose is to assure protection which is the prerogative of the commonwealth, and which requires def-

inition for application under the specific circumstances presented by special callings. Theoretically there must always be a *quid pro quo*, a mutual benefit accruing to both the specific persons involved and the commonwealth, in order to insure validity. To particularize would carry me beyond the scope of the present discussion. The hint is thrown out merely to show how readily excess of zeal may sweep legislatures into the enactment of unconstitutional measures.

Mine inspection should concern itself essentially with the concrete; with the mechanical, considered in its broadest sense; and not with relations between capital and labor. Those questions should be reached by other routes, because they involve questions which necessarily must be determined by judicial process and which cannot properly be submitted to the summary action which is usually conceded as a necessary part of the powers conferred upon a mine inspector. Insistence must be made upon the necessity of reciprocal benefits between operator and operative in the regulations for mine inspection. What benefits the laborer should benefit the property, and vice versa. The basis of legislation is ultimate economy and not theoretic altruism. The case for economy can easily be made out when it comes to legislation for mines. No one desires the loss of human life; this for humane reasons as well as for economic, and that which endangers life is always more productive of injuries which merely cripple men and from the standpoint of mine operators this is costly and is becoming more so since the responsibility of employers in this regard is becoming more sharply defined by law. There is apt to be, however, indifference to the health of employees and it is difficult to convince employers that removal of unhealthful conditions necessarily involves greater efficiency of labor.

Another advantage of judicious mine regulation is found in the better maintenance of equipment. It tends towards standardization, which is also economical. It demands attention to detail, which makes for efficiency and reduction in cost. Although home-made appliances may be impossible in compliance with the law, the end is to improve conditions for profitable production.

Mine inspection should be placed completely beyond the power of inspectors to display favoritism, under which is veiled the possibility of graft. The only safeguard against subversion of inspection to unworthy ends is to make the regulations specific and mandatory. Discretionary power must be allowed to a certain extent, but this should be as circumscribed as possible. The summary powers of a mine inspector should be limited to as few cases as may be permissible for the proper execution of the act and in all cases where immediate danger to human life is not involved recourse to regular judicial process should be required. There are few powers which can be conferred upon a layman so dangerous as judicial functions. It is clearly unwise to invest mine inspectors with advisory powers. The danger from so doing lies in the excuses which could be offered to exculpate themselves from blame by corporations and individuals who had acted under ad-

*Address presented at the American Mining Congress, Goldfield, Nevada, September 29.

vice which the law had not contemplated in its specific definitions of authority.

The character and qualifications of mine inspectors is a matter of serious import. This is one of the questions which need not of necessity be uniform throughout the country. It is a question regarding which differences of opinion can probably do no serious harm. As a matter of opinion, I venture to affirm that well-trained men who are competent to assume the responsibility of mine foremen, generally make the best inspectors. The tendency is growing to require mine foremen to pass examinations and obtain certificates in the same way as the law requires for engineers. This will insure a higher grade of intelligence and a knowledge of technical methods superior to that generally possessed by mine foremen today, and which would be adequate for the purpose of administering the law. Selections made from such a class will insure a knowledge of minute detail which is of the highest importance.

The subject matter of mine regulations will involve many points. The conditions affecting surface plant should follow in the main such regulations as apply to factory inspection. There is no essential difference between conditions leading to safety in factories and in the surface plant of mines and smelters. The conditions met with underground, however, are extremely special in their nature. The dangers of traffic in shafts are well known. They require inspection of track and guides; inspection of cages and skips; detailed inspection of cables and safety devices; constant inspection of spots where weakness is known to exist; inspection of loading-pockets to prevent the possibility of accidents from falling rock and ore; inspection of the signal system, and finally, absolute uniformity throughout the country, of mine signals. Lack of uniformity in the signal system is peculiarly dangerous, and yet not even so simple a matter as requiring one bell to start, and one bell to stop when in motion, has become universally adopted. Montana has made the greatest advance in an attempt to elaborate a signal system, but even that is not well enough perfected to insure freedom from confusion of signals. Drainage problems, likewise, require careful regulation. This involves proper grade for levels, thereby promoting healthful conditions underground; and inspection of pumping equipment and investigation of the relation which the capacity of such equipment bears to the quantity of water actually to be handled daily, in order to insure an ample margin of safety in case of sudden accessions. Ventilation in metal mines has to do wholly with health; in coal mines it has to do also with protection of life from explosion. The conditions found in coal mines are so unlike those of metal mines that regulations applying to one could not justly be made to apply to the other. In fact the peculiarities of coal mining require a set of regulations especially designed to meet them, and it can hardly be expected that the same inspector could serve for both. A sharp distinction should be drawn between the police regulation of coal mines and metal mines.

Sanitation is a matter which receives great attention abroad, but has been generally ignored in

America. There is no doubt that mines are frequent breeding-places for tuberculosis, typhoid, diphtheria and other germ diseases. The contamination of waters underground by seepage from the surface is a common cause of peril and has been recognized by foreign regulations. Provision for ample exits in proportion to the size of a mine and the number of workmen employed, is another matter which requires to be carefully regulated. The growing use of electricity under high tension in mines necessitates provision for safety both in regard to the lives of workmen and the possibility of fire. To a certain extent the methods of mining employed may be subject to inspection and discretionary regulation for the protection of human life. This is a matter of grave import; one in which a careless or prejudiced inspector might easily subject mine owners to inconvenience and financial loss, and cases are constantly arising where chances are being taken that are wholly unwarrantable. Summary action may be necessary on the part of an inspector where peril is imminent but in such cases provision should be made for immediate determination by a competent committee to prevent the continuance of an unjust injunction against operation. It is a matter in which regulation is necessary, but in which the interests of operators should be guarded with extremest care. Authority to close old workings is necessarily one of the legitimate functions of a mine inspector in all cases where peril may otherwise exist. Reports of mine inspectors can easily be made the subject of abuse. It seems unwise to combine the function of mine inspector with that of conveyor of information to the public. The publication of data concerning the extent of workings and of geological conditions should be eliminated from an office which essentially pertains to the police.

I said in the beginning that mine inspection in foreign countries has been carried to a higher pitch of excellence than is comprehended here. It is manifestly desirable in consequence of this that we should inform ourselves concerning those systems before undertaking to create one for ourselves. Sometime ago the Technological Division of the United States Geological Survey invited a number of gentlemen identified with mine regulation in the European countries to visit the United States as the guests of this Government. They were taken through the principal coal fields and inspected our mines. The result of their criticisms was to awaken the public to a realization of the backwardness of our own legislation and to the need of a forward movement. This was followed by the sending of George S. Rice, mining engineer, Clarence Hall, explosive expert, and J. W. Paul, formerly mine inspector of West Virginia, to Europe to investigate coal mine regulations. This is a step in the right direction. It should be followed by similar investigation of regulations affecting metal mines, and it would seem desirable that more than a single individual should be sent for this purpose. We need not only the collection of data by an individual, but the value of the point of view of different intellects. As a preliminary, it might be advisable to obtain data by requiring special reports from our consuls

INSPECTION OF MINES.

Written for the MINING AND SCIENTIFIC PRESS
By J. A. HOLMES.

*Mine inspection is and should remain a function of the State. It has for its purpose the proper execution of State mining laws; and the object of these laws is primarily the safety of the miners, incidentally the protection of mine property. The agent of the State in the carrying out of these laws is the inspector of mines, and his assistants. These should be sufficient in number for frequent and thorough inspection; the basis for selection and continuance in office should be fitness for office, efficient service, and good behavior. They should be independent of political or other extraneous influences. They should receive compensation for services commensurate with the responsibility resting upon them, and the experience and technical training required. They should have reasonable laws to execute. They should have the willing co-operation of both operators and miners in carrying out the provisions of the law. Under such conditions men of the best type will accept and hold these positions, and their actions will receive the support of public opinion and of the courts.

This inspection by officers of the State, whenever practicable, should be supplemented by the work of special inspectors employed by the mining companies. Many companies have already adopted such a practice and report favorable results. In other coal mining countries this practice has become much more general, but in recommending to American coal operators the adoption of practices found successful in other countries it should be remembered that the selling price of coal at the mines in the United States is less than half that in other countries; and this fact may render impossible here many improvements in behalf of safety and efficiency which the American operator would otherwise be glad to inaugurate.

The function of the Federal Government in connection with mine operations is one of inquiry and research, having in view two fundamental purposes: (1) greater safety for the lives of miners; and (2) the conservation of mineral resources.

In connection with ordinary mine inspection the special service rendered by these investigations will be: (a) the development of data such as will serve as a basis for the enactment of reasonable laws, rules, and regulations; (b) the establishment of facts which may serve as a basis for the settlement of disputes between inspectors and operators or operators and miners, either by the courts or boards of arbitration.

The propriety of having such inquiries and researches conducted by the Federal Government in relation to mining, will scarcely now be questioned in view of the fact that such policy has long since been accepted in relation to agriculture, forestry, fisheries, and other industries, but it may be added that the practice avoids extensive duplication of labor and expense by the States. The Federal in-

vestigations naturally cover a wider field of experience, including also experience in other countries; and the results are likely to be more generally accepted as impartial, being further removed from local influences.

Under such an arrangement there will be no basis of conflict between the State and Federal interests; no encroachment of one on the duties or rights of the other. The support of the Federal work will depend upon its securing and maintaining the good-will and co-operation of the State's inspectors; and the success of both the State and Federal work will depend upon their securing the proper friendly co-operation of the miners and operators. Nor is anyone now likely to question the proposition that the conservation of resources is a national as well as a State problem. In the mining, treatment, and use of mineral products, no State boundaries are involved. An ore mined in one State may be milled in another, smelted in a third, refined in a fourth, and used in many different States. The coal mined in Pennsylvania or in West Virginia may serve as a basis of heat, light, power, and various manufactures in a dozen or more different States, and may be essential to the interstate transportation of mails, passengers, and freight; while the manufactured products to be transported may in turn serve as an essential basis for other industries in the remotest parts of the countries. The iron ore of Minnesota, may in Illinois be mixed with coke from Pennsylvania, and limestone from Indiana, to be fabricated into steel to serve as frames for buildings in San Francisco, or New Orleans, or Boston, or as railway bridges across the Columbia, the Mississippi, the Hudson, or the Nile.

The products of the mine constitute no less than 65% of the total freight-traffic of the country; they are indispensable to inter-state and international commerce; and are essential to both present and future welfare and to greatness as a nation. It is believed that the development of a system of co-operation between the Federal and State authorities such as is thus outlined, will contribute to the improvement of the service by both the State and Federal Government; will safeguard the rights of the States; will give greater uniformity to mining law and rules in the different States; and will be generally helpful to the mining industries of the country.

MINERAL AREAS IN KOREA.

Korean Government authorities place the number of localities in Korea suitable for mining at 184, including gold, silver, copper, iron, lead, graphite, zinc, coal, petroleum, and mercury. Aside from seven gold mines, two copper properties, a number of iron prospects, two or three graphite mines and a couple of coal deposits, the mineral resources of the kingdom are undeveloped, and as yet, largely unproductive. A number of claims have been filed but the holders of mineral areas in Korea are, as a rule, unprepared in a financial sense to do development work. Korea, therefore, offers opportunities for those desiring to investigate mineral deposits with a view to investing should expert examination prove satisfactory. Of 438 concessions granted, 107 are for placer mines.

*Address presented at the American Mining Congress, Goldfield, Nevada, September 29.

PETROLEUM IN BURMA.

By E. A. WAKEFIELD.

*While the oilfields of Burma have been worked since the middle of the eighteenth century, it is only since 1889 that the industry has been operated with modern appliances and in a business like manner. Prior to that date the work was carried on spasmodically by the Burmese hereditary oil diggers. The richest oil-bearing tract of Burma lies in the valley of the Irrawaddy, in upper Burma, in the southern portion of the dry zone. Considerable oil is still obtained from wells dug by native labor, but the principal output is from wells regularly drilled with modern machinery. The output of the hereditary well lessees is purchased by the refining companies at varying prices. A royalty is paid to the Government of 16c per 100 viss (365 lb.) in the case of early leases, and 16c. per 40 gal. in later ones. A system of pipe-lines has been installed. The first section was about 45 miles in length, connecting the fields at Singu and Yenangyat with Yenangyaung, and pumping stations were installed at Singu and Yenangyat. About the same time another line was constructed to convey the oil from the tank-boats to the refineries. As both these lines were operated successfully, the construction of a pipe-line from Yenangyaun to Rangoon, a distance of 275 miles, was begun early in 1907. This line is now completed and will materially lessen the cost of transporting oil from the fields to the refineries. There are four pumping stations on this line, each connected with Yenangyaun and Rangoon by telegraph.

Oil is also produced in the districts of Kyankpyu, Akyab, and Thayetmyo. Prospecting is continually going on, and there is no doubt that there are many valuable fields as yet undiscovered or undeveloped. From the Cheduba wells, in the Kyankpyu district, a thick dark-colored oil is obtained which is used for burning, for covering the bottom of boats, and as wood varnish. The amount obtained from these wells is, however, quite insignificant. The methods used in obtaining this oil are primitive and wasteful. The earth is turned up to a depth of 2 ft. over a surface of about 20 sq. yd., around which a bank of soil is raised, forming during the rains a shallow pond. The oil rising to the surface of this pond is skimmed, scooped up with cocoanut shells, and placed in earthen pots. This operation takes place at day-break, when the temperature is lowest, as during the heat of the day it is nearly or quite impossible to separate the oil from the water. In the months of March and April these ponds gradually dry up, and the bottom of the pond is again dug up and prepared as in the first instance. The deeper the pond is dug the greater the season's product.

Some of the native hereditary oil reserves are of considerable importance, but as they are usually worked in the most primitive manner the yield is small compared with the output of the English firms, and there is always the danger that the methods of extraction may reduce the permanent output. Two of these native reserves are of decided importance,

the Twingone, about 300 acres in extent, and the Beme, containing about 160 acres. The number of private wells and well-sites in these two reserves is now over 3700. Of this number, however, some 1500 have been temporarily taken over by the Government for non-observance of regulations.

At present the best known and developed field is at Yenangyaun, the average daily output being about 15,000 viss (54,750 lb.). There are other newer fields being developed, which are producing oil in constantly increasing quantities, notably the ones previously mentioned at Singu and Yenangyat. In Singu township oil was first struck October 30, 1901, and the output has been steadily increasing since that date. The oil produced from these wells has an extraordinarily low flashing point (below 40°F.), while the specific gravity of the oil is 0.8247. At the present time nine companies are engaged in the extraction or refining of petroleum, with a combined capital of \$22,700,000. The value of the unrefined oil produced in 1901 was \$983,551, and in 1907, \$2,917,895. The output of the Burma oilfields is all disposed of in Burma or other provinces of India. For the three years from 1903-4 to 1905-6 a considerable amount of oil was exported, principally to the Far East. With the exception of that period, the oil dealers have confined themselves to the Indian market.

A considerable quantity of high-grade oil is imported into Burma, principally from the United States. In 1907-8 the imports amounted to 2,230,592 gal., valued at \$407,048, of which 2,188,442 gal., valued at \$396,693, were from the United States. Burma's trade in oil with different parts of India, excluding the trade of Rangoon and vicinity, in 1901-2 was 16,542,432 gal., valued at \$2,657,554; and in 1907-8, 69,464,772 gal., valued at \$7,218,390. The Burma Oil Co. has enlarged its refineries for the purpose of supplying fuel oil to the British admiralty, and it is expected that large shipments of this commodity will be made in the future. There are between 75 and 100 Americans engaged with the various companies, and the opportunity to increase the sales of American machinery should not be overlooked.

SAND-LIME BRICK.

The sand-lime brick industry is comparatively new in the United States, having had its beginning in Michigan City, Indiana, in 1901. Its progress was slow at first, the value of the production in 1903 being only \$155,040. From that time the value increased each year until 1907, when the maximum of \$1,225,769 was reached. In common with other building materials there was a decrease in 1908 in the production of sand-lime brick to \$961,226. The number of plants reporting made a rapid growth from 16 in 1903 to 94 in 1907, with a slight decrease in 1908, to 87. Common, front, and fancy brick were manufactured from sand and lime in 1908. The average price per thousand for common brick was \$6.63, as against \$6.61 in 1907 and \$6.71 in 1906; for front brick the price was \$12.16, against \$10.96 in 1907 and \$10.42 in 1906. In 1908 common brick composed 83.57% of the value of all bricks and front bricks 15.37%.

*Abstract from *Daily Consular and Trade Reports*.

THE MINING MAN'S INTEREST IN LAND CLASSIFICATION.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE OTIS SMITH.

*The classification of the public lands is at the foundation of both effective administration of the public lands and of the enactment of proper land legislation. On this account the discussion of this subject is germane to this Mining Congress, and no class of citizen should extend more hearty support to the Federal Government in its work of land classification than those who are interested in the honest and intelligent development of the mining industry. The work of classifying the public lands was authorized by Congress in 1879 and was then specifically assigned to the Geological Survey, which was also intrusted with the investigation of the mineral resources of the country. The relation of land classification to the mining industry appears to have been uppermost in the minds of those who were active in creating the Geological Survey, and of those who shaped the legislation to that end. That this duty was not definitely accepted in the early days of the Survey now seems unfortunate in that the opportunity was lost for a scientific classification of the public lands before the larger part of the more valuable areas had passed into private ownership. Yet the years have been well spent in the important task of determining the natural resources of the public domain, in training a force of geologists and engineers competent to do this public land work, and in winning the confidence of the people in the ability and integrity of the Survey as an organization. The results of the land-classification work undertaken by the Geological Survey three years ago, and now in progress on an extensive scale, derive their value from the existence of this body of trained men and from the large stores of geologic, topographic, and hydrographic information collected in the course of the Survey's investigations.

The classification of the public lands as now prosecuted by the Geological Survey serves two important ends, one administrative, the other legislative, and I believe that both were contemplated by Congress at the time of the creation of the Survey. The work of the Survey since 1906 on the public coal-lands constitutes its largest contribution to land classification. The primary purpose of these classification-surveys in the coal fields of the public-land States is to promote the utilization of these great fuel reserves, the most important natural resource to which the people retain an unquestioned title. Under the regulations setting forth the plan of valuation of Government coal-land the price is determined on the basis of estimated tonnage and the unit rate varies with the quality of the coal, ranging from $\frac{1}{2}$ to 3c. per ton for coal deposits within 15 miles of a railroad. The prices thus calculated for the public coal-deposits average less than one-tenth the usual royalty paid in the West, yet this conservative valuation will more than double the average price of the public

coal-lands, not to mention the fact that this policy of land-classification has stopped the illegal disposal of coal-lands at even less than the minimum coal price. I maintain that the Government valuations will not impede the disposition of the coal-deposits for purposes of utilization. The real development of the West will be promoted, not retarded. As the public lands are now administered the honest coal entryman need no longer fear the unfair competition of the less scrupulous who may enter 160 acres of coal land as a homestead.

In the Western oil fields the classification-work by the Survey has resulted in protecting the oil man from the agricultural claimant, and with a better law the reports of the Survey geologists would also protect the oil prospector from the devices of the gypsum entryman. The next move on the part of the Federal Government in its capacity as the present owner of a large acreage of oil lands should be to protect the oil industry from itself by preventing injury to future productiveness by reason of reckless drilling and by discouraging production in advance of possible disposal.

At the present time it is generally realized that natural wealth is the source of national prosperity, and the rational utilization of natural resources is recognized as the only means to continue that prosperity. Utilization is opposed alike to non-use and to waste. To withhold the land from private use except where public use is of greater advantage to the people, is to check national progress; to dispose of the people's land for other than its highest practical use is to waste that property and to betray a trust. The public-land problem thus resolves itself into, first, the determination of the best use to which the public domain can be put, and second, the disposition or reservation of the land now belonging to the nation so as to assure that use. Such a land-policy needs no defense, for it is based on the safe principle of the greatest good to the greatest number.

To attain this high aim of making the best use of the public land, legislation is necessary, and as a preliminary to legislation exact knowledge is required in the form of a scientific land classification. In a number of instances Congress has already used the results of investigations by the Geological Survey, and at the present time land-classification work of several types is in progress, which has the definite purpose of aiding proposed legislation. For instance, phosphate-land surveys are now being made to furnish authoritative information to be placed before Congress for its use in legislation to promote the best development of these important deposits of mineral fertilizers. This effort to secure special legislation is inspired by no dog-in-the-manger spirit, and no attempt to keep the people out of the public domain is contemplated. The mineral law in its application to deposits of phosphate-rock is equivocal, and the present investigations are being made with the sole purpose of placing the facts before Congress. Whatever legislation is proposed, it surely will not be restrictive of development for the good of this nation, nor will it look toward the non-use of the earth's bounty, but rather toward the promotion of

*Address presented before the American Mining Congress, Goldfield, Nevada, September 30.

the mining and utilization of this valuable rock, on which the nation's agricultural life will later depend.

As another line of land-classification work in aid of legislation I may cite the water-power investigations. The information available as to the undeveloped water-powers of the United States is far from complete, but to a large extent it represents the work of the Water Resources and Topographic branches of the Geological Survey. With these earlier records and surveys as a basis, the Survey is now actively engaged in examining power-sites to which the Government still retains the title. Again, the purpose is to aid in the enactment of legislation that may promote and not hinder development of these water-powers as rapidly as the industrial, transportation, and other needs of the nation demand. Those who are making a study of the water-power problem fully realize that economical utilization of these natural stores of energy requires their development on a larger scale with the investment of capital in large amounts. The day is past for inexpensive, inefficient developments where only the minimum flow is used. Keeping in mind the present demand for power that can be depended upon, we need not look far into the future to see storage as a universal factor in water-power development. Utilization of the undeveloped water-powers on the public domain, therefore, involves either Government development or long-time leases of these power-sites to strong financial interests, and in the latter event the law must provide for effective Government control that will insure that the profit upon the capital accomplishing the development cannot impose unjust burdens upon the users of the power, whether the utilization be for transportation, city lighting, or motive-power.

The recommendations made by the Geological Survey have already resulted in 46 temporary withdrawals by the Secretary of the Interior of power-sites on 42 rivers in seven of the public-land States. Were I to present a map showing the distribution of these power-sites now temporarily withdrawn, their relation to the great mining districts of the western country would be at once noticeable. No better argument could be presented to convince one that the Federal Government deserves hearty support in this matter of land classification. Many already realize the importance of Federal protection through legislation to the small operator of the future. The Governmental control of power-charges may mean the difference between the closing down of a mine and its operation at a profit.

An adequate classification of the public lands is furthermore essential to the development in the land-laws of the principle of relative worth, which is that the land must be so disposed of or so reserved as to secure utilization for the purposes for which it is most valuable. No principle is more fundamental to real conservation, and at the same time more beneficial to the mining industry, than this of giving preference to the highest possible use for the public lands. The earliest land-laws, those of a century ago, provided for the reservation of mineral lands from disposal for other purposes, and the present coal-land law expresses this principle of relative

worth by giving gold, silver, and copper deposits priority over the coal, and coal in turn preference over agricultural values. These distinctions necessitate land-classification based on adequate field examination, and with classification data at hand the principle of relative worth can be further developed. Wherever the different values conflict the higher use should prevail. For example, the reservation or disposal of a tract of land for a dam or reservoir-site should have preference over its use for agriculture.

The best example is afforded by the case of agricultural and mineral lands in national forests. The principle of relative worth is recognized by the statute which specifies that it is not the intent of the act providing for these forest reservations "to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes." Classification-work in the form of topographic surveys by the Geological Survey in the national forests is specifically provided for by appropriation, and last year Mr. Garfield, speaking in behalf of this item before a congressional committee said: "It is the part of wisdom to do this work in the forests at the earliest practicable date, because it will make possible the elimination from the national forests of areas which ought not to be there."

On the other hand, wherever the different values can be separated, that separation by appropriate legislation is at once the easiest and best solution of the problem; for instance, the surface rights may be separated from the right to mine underlying beds of coal. The first step in this direction was taken in March of this year in the passage of the Mondell Act for the protection of the surface-rights of entrymen, whereby the home-seeker may secure all for which he made entry—all that he swears he is getting—while the coal beneath his tillable land is reserved to the nation for future disposal.

Land legislation of the future should strengthen this principle of relative worth where it already exists in law, and introduce it further in all new legislation. In his report as Commissioner of the General Land Office two years ago, the present Secretary of the Interior expressed this same ideal in land legislation and administration, stating that the end to be sought is "that the remainder of the public lands shall be devoted to their greatest beneficial use for the States as well as for the Government at large." To accomplish this I would add that land classification must be scientific and detailed in order that data may be available for the guidance of Congress in wise legislation and of the executive officer in just administration of the public lands. Such a classification should not be an arbitrary dictum, nor is it necessarily final, but as Mr. Ballinger put it "there should be reposed in the Secretary of the Interior the continuing power of re-classification to meet changing conditions, which may necessitate the transfer of lands from one class to another." As to re-classification I assure you that the Geological Survey stands ready at all times to review and revise its land classification in the light of changed conditions, new data, or discovered errors in previous work. A scientific bureau could not take any other position.

GOLD ORE NEAR NEWCASTLE, COLORADO.

Written for the MINING AND SCIENTIFIC PRESS
By FORBES RICKARD.

An interesting discovery of gold ore in commercial quantity comes from a region that for more than 200 square miles has never been known in connection with precious metal mining. This is instanced in the carload shipments of sulphide ore carrying from 1½ to 2 oz. gold from a new mine development near Newcastle (on East Elk creek, on the White River Forest Reserve, Garfield county, Colorado. Newcastle and the country tributary to it has been long known as a coal mining centre. The accompanying illustration shows the quartzite sedimentaries below the limestone of the coal measures, lying on the eroded surface of the underlying Archean gneiss and crystalline schists.

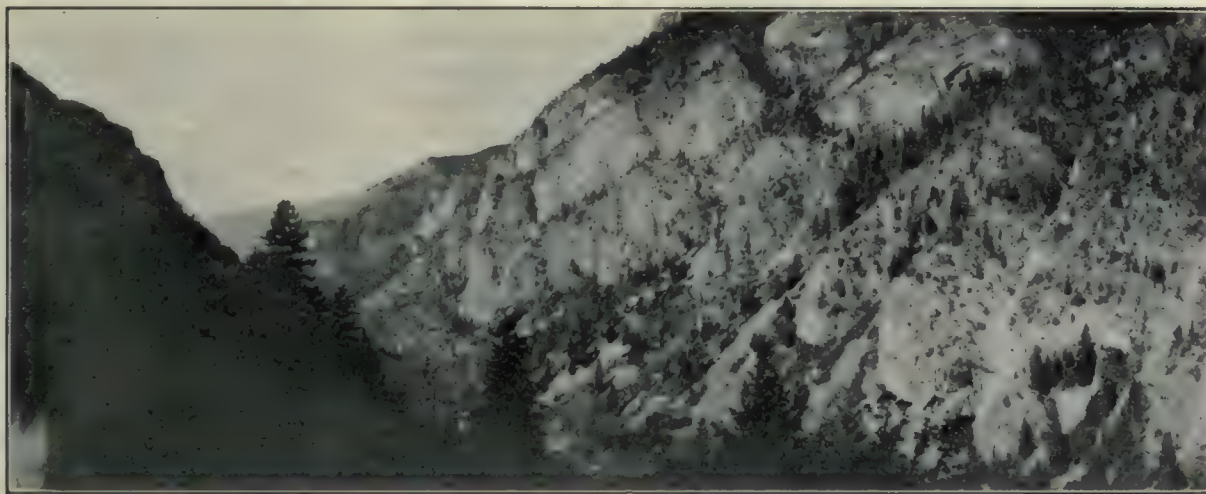
This proximity of coal measures with deposits containing ore of gold and silver in marketable quantity

lower horizons in the intervening 750 ft. to the bed of Elk creek below and other adits will follow the discovery work above described. The covering of the vein by talus heaps and rock slide has made difficult the prospecting for lower sites.

Though such discovery as this may not mean the bringing in of a new camp of any great importance, it at least marks the beginning of a prosperous mine and points to interesting possibilities in the way of mine discoveries where they are least expected.

DRESSING AMALGAMATING PLATES.

Under the new gold-law regulations, in the Transvaal, covers with double locks have to be used on all mill-plates. This necessitates the presence of two men each time the covers are removed, and as every dressing entails extra labor and the withdrawal of shift-men's attention from the running of the mill, it is evident that reduction in the number of plate-dress-



Coal Measures Overlying Archean Rocks Near Newcastle, Gold Mine Dump is Near the Centre of the Picture.

adds interest to the discovery and serves to recall other instances in Colorado where coal and gold fields are almost contiguous. There is the Ten Mile district, near Leadville, where zinc ore containing silver was mined from the Robinson limestone which constitutes the base of the lower coal measures in that locality; another in the case of the Crested Butte anthracite deposits in close proximity to silver mines, and still another case, but further removed, is the mining of ores of gold and silver in the gneiss and crystalline schists of the foothills that flank the coal and oil fields of Boulder county.

This Newcastle gold mining development dates back a few months only and credit for its development belongs to the Western Investment Co., and its manager, F. V. Bodfish. In the illustration there is shown the opening of an adit which is about 100 ft. in length. As far as the work has gone a continuous vein occupying a fault fissure in the gneiss has been followed. It varies in width from a few inches to 2½ ft. An average of something more than one foot of heavy iron sulphide with a gold content of from \$30 to \$40 gross assay value is found. This valuation is based on sampling made at close intervals for the distance driven. The adit gives from 125 ft. to 130 ft. of 'backs' and the vein has been picked up at

ings would be beneficial, provided the total extraction be not detrimentally affected. Trials were accordingly undertaken, with the result that the extraction was higher for periods of 12-hour dressings, but on the other hand, and in part explanation of this, the gradings show a finer product passing over the plates during that trial. A further experiment, covering a period from February 11 to April 19, 1909, was undertaken to determine the extraction at different intervals between the dressings of the plates, and the results showed that the extraction progressively improves up to six hours from the time of dressing plates, and then falls off again, until at the end of 12 hours it has dropped to 49.10%, or 0.09% lower than that obtained three hours after dressing. The highest extraction of 53.57%, obtained six hours after dressing, has an original value of 8.38 dwt., while for the lowest extraction, 49.10%, obtained 12 hours after dressing, it is only 7.79 dwt., this being the lowest original value on the tables. The plates must be in good order, and a sufficient setting of amalgam left after the clean-up. If the plates are scraped to bare copper, a practice only too common, good amalgamation will not be obtained even with dressings every hour.—G. O. SMART, Jour. Chem., Met., and Min. Soc. of S. A., June '09.

ASSAY OF CYANIDE PRECIPITATE.

Written for the MINING AND SCIENTIFIC PRESS
By FRANK A. BIRD.

Although an abundance of information upon the cyanide process is published in the MINING AND SCIENTIFIC PRESS, I have failed to observe any upon the present day practice of assaying the precipitate. Believing that such will be of value to readers of the PRESS, I herewith submit the methods as commercially carried out in the Salt Lake district.

First method. While no special directions as to fluxing for the preliminary fusion are necessary, the following flux-mixture has been found to give perfect results. It can also be used as a fire-assay lead-flux, and, with the addition of litharge, for silicious gold and silver work.

The following is the flux-mixture:

| | Per cent. |
|--|-----------|
| Sodium carbonate (soda ash grade), 4 lb..... | 38.1 |
| Potassium carbonate, 4 lb..... | 38.1 |
| Flour, 1½ lb..... | 14.3 |
| Borax glass, 1 lb..... | 9.5 |

The crucible charge consists of: 18 gm. flux mixture, having a reducing power of about 25 gm.; 3 gm. borax glass; 50 gm. litharge.

This thoroughly mixed in a 20-gram crucible, and then 1/10 assay ton of precipitate, which has been carefully weighed upon a delicate analytical balance, is added and again mixed well, the mixing spatula being brushed into the crucible as it is removed; a light cover of soda is then added. About nine crucibles are prepared in this manner, three of which will be used for the silver assay alone, the balance for the gold. The prepared crucibles are placed in a muffle at not too high a temperature, although no special precautions are taken to have it extremely low for gold-precipitates. After quiet fusion is attained the crucibles are heated intensely for a half hour, the furnace being fired lightly about every 10 minutes. As the melts are poured, cover each with an inverted scorifier to prevent the slag flying as it cools. Slag and cube the buttons, as usual, saving the three slags representing the silver part together, and the six for gold together. As it is necessary to know the approximate gold-content of the sample the three buttons representing the silver assay are first cupelled; as this cupellation finishes, a play of colors will be noticed upon the button wholly unlike any ordinary cupellation; this is due to some zinc which has been reduced and has remained throughout the operation; it may be necessary to push the cupels a little farther back in the muffle before this totally disappears, and it may last from five to ten minutes longer than would the ending of an ordinary cupellation. Clean the buttons over a pan containing slags, and to which the cupels, cleaned free from unused bone-ash, have been added. The buttons are weighed and entered in the work-book as ounces of gold and silver.

To the six lead buttons, representing the gold assay, are added five times the weight in milligrams of the cupelled silver buttons, and ten milligrams of pure copper, which will prevent the buttons spitting as they finish. These are then cupelled in the ordin-

ary manner, no special precautions being necessary. After brushing the gold buttons over a pan containing the six slags and cleaned cupels, they are placed separately, without any flattening, in parting capsules containing hot nitric acid (2 parts of acid to 1 of water). Parting proceeds quite vigorously, the gold flouing into one sponge; should it be necessary the buttons are assisted in breaking up with a glass rod, but if the specified quantity of silver has been used, and the parting-acid is hot, and of the concentration indicated, it rarely happens that they require any further attention than most careful watching and regulation of the heat of the parting-plate. After the parting finishes, decant the acid and add another quantity of the same as a precaution; heat cautiously as it is inclined to 'bump', and continue about 15 minutes after steam begins to show, then decant, wash twice with ammonia water and once with pure distilled water, dry very carefully, burn, weigh, and enter in the work-book as commercial gold assay. This deducted from the ounces of gold and silver makes the commercial silver assay.

Working by this method reduces to a minimum the chances of reporting silver with the gold. I have dissolved gold buttons which had been alloyed with three times their weight of silver and parted as coronets, and found that they contained as much as 13 oz. silver.

The two sets of slags and cupels are first weighed, and then crushed to about 30-mesh. Two crucibles are run for silver and four for gold, the quantity taken being the nearest 50 gm. the total weight can be subdivided into. The charge is as follows:

18 gm. flux-mixture, 10 gm. borax glass, 6 gm. fluorspar, 30 gm. litharge, 50 gm. slag and cupel mixture.

Mix well in the original crucibles, cover lightly with soda, and fuse at not too high a temperature, as it boils badly and requires constant watching; add salt as usual when the danger point is reached. When quiet fusion is attained heat at a high temperature the same as was done with the precipitates. pour and cupel as usual; the gold buttons can be parted direct, sufficient silver being present. Weigh the buttons in fractions of milligrams and calculate to the weight of the total mixture, and then to ounces; deduct the weight of the pure gold found from the silver buttons, and then add each to the commercial assays, which makes the corrected assays for report.

Metallies are usually received finely divided; these, when submitted with the fine material, are assayed the same, about two crucibles for silver and four for gold being run; if the precipitate assays low in silver no correction is deemed necessary, but one is always made for gold.

The above method outlines the scheme as applied to gold precipitate. Silver precipitate is assayed in precisely the same manner; the first fusion, however, must be commenced with an extremely low heat, the muffle gradually being brought to redness as the fusion proceeds, otherwise the results are low, probably from volatilization. Six crucibles are enough for the gold, each button being parted separately with one part of nitric acid to eight of water.

Second method. This is applicable to gold preci-

pitrite, but not to silver. The preliminary preparations are the same as in the first method, but only six crucibles are necessary; cupellation must be carried out as the assay for silver, otherwise any zinc not driven off will be reported as gold. The gold-silver buttons, having been weighed, are dissolved separately in aqua regia (1 part nitric acid, 3 to 4 parts hydrochloric acid, these to be diluted once). The gold dissolves quickly, the silver precipitating as chloride; after solution of the gold, dilute to about 100 c.c. and stir well, allow the silver chloride to settle, then filter upon small paper; wash thoroughly with cold water, place in scorifiers, carbonize in the front of the muffle, then add 30 gm. granulated lead, a pinch of borax-glass, and scorify; cupel and weigh as the commercial silver assay, and this deducted from original weight gives the commercial gold assay. As a precaution buttons may be parted for gold; none should be found. The slag and cupel-mixture from the crucible assays must be assayed for gold and silver, about two crucibles for silver and four with an addition of silver for gold; the scorification slags and cupels should also be run for silver. Instead of mixing all the slags and cupels together, a slag and cupel from each assay may be pulverized together, then divided into two parts and run in the original crucible, and in one new one, the two buttons being weighed together and added to their assay.

Although methods have been applied recommending the all-scorification method in preference to the crucible, my experience has been that while the commercial assay is higher the corrected assay is far below. I believe the crucible assays, as outlined above, answer every purpose, and are equal to any method used in present practice. For gold work only, commercial litharge will be found as satisfactory as the higher-priced chemically pure article. Cupels are preferred that are very soft; this is accomplished by making the bone ash barely moist with water and compressing very lightly. Nothing but the bone ash and water is ever used.

PROTECTION OF MINE INVESTORS.

The Mining and Metallurgical Society of America has formulated an opinion after a year's deliberation on what stockholders of mining companies should expect to find in the annual reports issued by such companies. It believes that this is a matter of interest to every legitimate investor in mining securities. That many stocks are highly overvalued is a fact notorious among mining engineers. To affirm this as a fact implies no disloyalty to the business itself, for the mines of the country produce two billion dollars worth of output each year, and employ probably two and a half million men. It seems inevitable that a business of such proportions must be more and more consolidated, and must furnish a legitimate field for the investment of the savings of the public. If mining stocks were valued on sane and proper principles they would be as sound securities as any on the market. Indeed some of them are today.

But loyalty to the business itself is one thing; support of the inflators of mining stocks who pre-

sume to represent the mining business is quite another thing. The inherent illusion by which mining stocks are overvalued is the capitalization of the dividends of mines on the same basis that the income of railroads and other permanent businesses is capitalized. This ignores the fact that a large number of mines are short lived. Innumerable stocks are sold at such a price that their dividends will make a return of only 3 to 4% annually, and yet their expectation of life may be only a few years.

The Mining and Metallurgical Society of America consists of mining engineers, mine managers, metallurgists, and geologists. It was organized about a year and a half ago to discuss questions of importance to the profession of mining. Its membership is now about 150, and while not all the prominent men in the profession have joined, it may fairly be said that the Society's membership is drawn from the mature and conservative part of the profession and that it contains many eminently successful men. Its expressions are merely opinions; they do not bind even the members to any course of action, but the Society offers to the public the almost unanimous belief of its individual members.

The resolution on this subject, as adopted by the Society, reads as follows:

Whereas, The over-valuation of mining properties by investors and the public, due to ignorance of mining conditions and a lack of appreciation of the real nature of the investment, tends to increase unduly the profits of mine promoters and speculators, and to increase unnecessarily the financial risks taken by mine investors, to the ultimate disadvantage of the mining industry,

Resolved, That it is the opinion of the Mining and Metallurgical Society of America that, for the protection of shareholders and investors, every mining company should publish an annual report within 90 days from the close of its fiscal year, and such report should incorporate the following information:

(1) A brief review of the past history of the property, the work accomplished and the results obtained, with tabulated statement of expenditures and receipts from the beginning, marketable products made each year, and the sums received from the sale of same, the annual net earnings, and the disposition made of such earnings.

(2) A similar review, but in more detail, of the work of the year, with statements of the assets and liabilities (these statements to show all details as to capitalization of the company; the number and classes of shares outstanding at the date of the report; the respective rights of these shares; the number of shares remaining in the treasury; any options or contracts on such shares; any bonded indebtedness), receipts and disbursements, cost-sheet and other information as to work accomplished and results obtained.

(3) A statement of ore reserves at the date of the report, compared with the reserves of the previous year, with an estimate, by a competent authority, of the probable life of the mine.

The Inca Mining Co., operating a gold mine in the district of Carabaya, Peru, will erect a 100-stamp mill during the coming year.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Charcoal-iron is produced in the United States usually to the extent of nearly half a million tons per annum, although last year the amount fell to 249,000 tons. It is turned out by 17 States, the largest quantity, 143,000 tons in 1908, coming from Michigan.

Tube-mill costs at the Waihi gold mine in New Zealand are 28c. per ton. The power-costs constitute 12c. of this amount, the flints and liners 14, and the labor, repairs, and miscellanies 1½. These mills are grinding to 150 mesh. In Mexico the ores are usually ground to 200 mesh in tube-mills.

Antimony exists in large deposits in the Department of Ancachs, Peru, most of which are rich in silver. These are found in the vicinity of Huaraz, in the district of Recuay. There are also important deposits in the Department of Huancavelica, in which the ore as mined will assay from 40 to 50% Sb.

Under the recent mining act of California a claimant who fails to make the annual expenditure upon his claim is disqualified from re-locating the ground embraced in the original location or mining claim or any part thereof under the mining laws within three years after the date of the original location. Any attempted re-location thereof by any original locator renders such location void.

Copper absorbs hydrogen, carbon monoxide, and sulphur dioxide. The solubility for those gases increases with the temperature and decreases with the oxygen-content. With set copper the solubility of the gas is at a minimum on account of the low temperature and the high percentage of oxygen in the metal, and set-copper solidifies with a depressed surface.

Furnace-efficiency in boiler heating depends to a large extent upon proper regulation of the air supplied for combustion of the fuel. In ordinary good practice an excess of 30 to 40% of air over theoretical requirements is admitted. To find the percentage of excess-air, subtract the observed percentage of CO₂, as determined by an indicator, from 20.7; divide the remainder by the CO₂ percentage, and multiply by 100.

Cuban iron ore has been developed on a large scale by the Spanish-American Iron Co. The deposits are in the Province of Santiago de Cuba, and boring-tests have proved a total of 600,000,000 tons. Other deposits of almost equal magnitude exist at Moa and at Baracoa. The company above named is expending \$5,000,000 in railways and other improvements needed for working the mines, the present output of which is 12,000 tons per diem.

Seprentine usually occurs massive, or in imbedded grains, and masses in the parent-rock. It sometimes forms seams resembling veins, depending upon the distribution through the original rock of the min-

erals from which it was derived. It is an alteration product from magnesian silicates, such as olivine, pyroxene, amphibole, enstatite, and mica. It is frequently associated with dolomite, and often contains considerable amounts of the partly altered original minerals.

Silver in ores is usually combined originally with sulphur, together with considerable amounts of antimony and arsenic. Oxidation results in forming silver sulphate, and there are generally sufficient chlorides present in the ore and waters to precipitate it as silver chloride. This is soluble to only a slight degree, hence secondary enrichments of silver ores are not so common. Depletion of the silver content of ores, however, occurs in many places. At Cripple Creek, Colorado, the silver has been abstracted to a notable extent from the gold ore near the surface. This is not the general rule, the gold ratio usually increasing with depth.

Magnesia is recovered from the chloride at Stassfurt, Germany, by mixing with calcined magnesian limestone in the ratio of 10 to 4. Water is added to make a thick pulp, which is then agitated. Lime chloride and magnesium hydrate are thus formed. The pulp is filter-pressed, the magnesium hydrate remaining on the filter. This is then washed, and calcined to drive off the water of crystallization. From the liquor issuing from the press the calcium chloride is also recovered.

Patent requirements and costs for an association placer claim, consisting of an area equal to 8 individual claims, or 160 acres in all, are, first, \$500 worth of work must have been done as a condition precedent to applying for patent; if on surveyed land re-survey is not necessary; in unsurveyed territory a survey must be made. The cost of that will depend upon the contract with the surveyor; deputy mineral surveyors usually charge from \$10 to \$15 per day, including time spent in office-work, and they require two assistants. Publication of notice will cost about \$20; Land Office fee, \$10; and for the land itself, \$2.50 per acre. In addition there will be attorney's fees, these being dependent upon contract.

Derecho as applied to land in Mexico is an undivided right, usually proceeding from inheritance. Such rights may exist in lands held by title originally issued to an individual, or in community lands. The law relating to *derechos* is complex. In general it may be said to carry the right to use the natural products of the soil where the exercise of this right does not trench upon rights previously established by the holders of other *derechos*. It also recognizes the right to fence in and use open areas within the lands pertaining to the estate, and the improvements made belong exclusively to the person thus making them. A foreigner may purchase a *derecho*, and it is often a convenient means of securing the right to use necessary areas surrounding a mine. The title to a portion of an estate obtained by purchase is not valid unless all the heirs join in the conveyance, and they are often so numerous that it is impossible to be sure that no necessary signatures to the document have been omitted.

COMPANY REPORTS.

CONSOLIDATED MERCUR GOLD MINES CO.

The report of this historic company for the year ending June 30, 1909, shows net earnings of \$34,005 from a gross income of \$774,417. This does not indicate inefficiency in the management, as every one realizes who knows the difficulties against which it has been necessary to contend at Mercur. The average value of all ore treated was only \$3.58 per ton, and the loss in tailing averaged 88c, leaving a net recovery of only \$2.70 per ton. The costs were only \$2.62 per ton; hence it is plain that one must travel a long way to find better management. The achievement is even more creditable when it is considered that the plant treated only 773 tons per diem; the total ore milled for the year amounting to 282,269 tons. The credit for this performance is due to George H. Dern, the general manager. It may be of interest to note that the costs given, as divided between mining and milling, were respectively \$1.53 and \$1.09 per ton. The cost of crushing is given as 9.6c.; the roasting of 107,007 tons of base ore, \$1.048 per ton; leaching, 41.4c; refining, 47c. In the slime-plant 27,523 tons were treated at a cost per ton of 24¼c. The precipitation cost was 48c., the zinc alone figuring 2½c. per ton of original total treated. The tailing losses consisted of 54c. in the slime, and 72c. in the sand rejected.

Development in the mines was conducted actively through the year, and the manager reports a large amount of unproved ground still remaining in the Mercur mine. Hence the indications are for a long life of this interesting property, where so many metallurgical experiments have been tried, resulting in the enrichment of metallurgic practice in general.

MONTANA-TONOPAH MINING CO.

The properties of this company are adjacent to the famous Mizpah mine at Tonopah, Nevada. It will be remembered that it was necessary here to sink over 200 ft. through later eruptives to reach the early andesite, the productive rock of the district. Fortunately the site chosen brought the shaft directly on the vein. Faulting is, however, so frequent in all this ground that the veins are only followed with great difficulty, and much shoveling of ore and tramming on intermediate levels is necessary. This accounts for the high cost of development shown by the report of Edgar Collins, the superintendent. In July 1908, the Triangle vein, or veins, was discovered. The new system consists of two, and in places three, veins which are more recent in age than those first developed. They are more regular, less faulted, and they extend below the andesite and into the dacite. The ore is partly oxidized, and contains an iron-stained clay which has caused trouble in the mill, owing to difficulties in inducing settling. The Triangle vein was discovered on the first or 396-ft. level, and has since been developed on the second, third, fourth, and intermediate levels. While, according to Mr. Collins, no orebodies of great size or richness have been found, the orebodies on this vein system show unusual continuity as compared with other veins in the property, and have yielded a large tonnage of ore. On the 396-ft. level 660 ft. of development has been accomplished on the Triangle veins. One of the orebodies found is practically continuous for 450 ft. Additional ore has been found on parallel stringers. On the 462-ft. level two parallel ore-shoots have been developed. The first, on the foot-wall vein, is 160 ft. long and has an average width of 2½ ft. The second, on the main vein, is 350 ft. long and is 4 ft. wide at the west end. On the 515-ft. level the vein has been opened 400 ft., practically all the way in ore, and averages 2 to 3 ft. wide. The vein is productive both in the andesite and the dacite; a fact of considerable significance as regards the life of the mine and of the camp. The Triangle vein has also been developed on the 615-ft. level. Within the year a diamond-drill hole was put down 860 ft. on the 765-ft. level. The Tonopah rhyolite-dacite was encountered at a depth of 750 ft., thus settling certain structural problems. Further development is being done by cross-cutting.

During the year the mine produced 41,692 tons of ore, practically all of which went to the mill, and 11,853 tons of waste. In addition 7848 tons of ore was milled for the MacNamara mine. Of the ore mined, 10,947 tons came from the first, 395-ft., level, and 1220 tons from the old dumps. The total mining cost for breaking and handling the ore amounted to \$3.47 per ton. The cost of development amounted to a further charge of \$1.645 per ton. The distribution of development costs and of mining costs for 11 months, covering 37,464 tons, is shown below:

| DEVELOPMENT COST. | | |
|---------------------------------|--|---------------|
| Labor: | | Per ton. |
| Breaking | | \$0.466 |
| Timbering | | 0.075 |
| Hoisting and dumping..... | | 0.108 |
| Foremen and shiftbosses..... | | 0.030 |
| Blacksmith sharpening | | 0.030 |
| Shoveling and tramming..... | | 0.393 |
| Surveying | | 0.023 |
| Watchman | | 0.009 |
| Storekeeper and timekeeper..... | | 0.006 |
| Diamond-drill hole | | 0.075 |
| | | <hr/> \$1.215 |
| Supplies: | | |
| Breaking | | 0.362 |
| Timbering | | 0.021 |
| Hoisting and dumping..... | | 0.049 |
| Hoisting—electrical power | | 0.061 |
| | | <hr/> 0.493 |
| | | <hr/> \$1.708 |

| MINING COST. | | |
|---------------------------------|--|---------------|
| Labor: | | Per ton. |
| Ore breaking | | \$0.826 |
| Timbering | | 0.187 |
| Hoisting and dumping..... | | 0.285 |
| Blacksmith sharpening | | 0.050 |
| Surveying | | 0.060 |
| Foreman and shiftbosses..... | | 0.077 |
| Sampling | | 0.026 |
| Assaying | | 0.025 |
| Shoveling and tramming..... | | 0.915 |
| Watchmen | | 0.021 |
| Storekeeper and timekeeper..... | | 0.015 |
| | | <hr/> \$2.487 |
| Supplies: | | |
| Ore breaking | | 0.486 |
| Timbering | | 0.174 |
| Hoisting and dumping..... | | 0.129 |
| Hoisting—electric power | | 0.161 |
| | | <hr/> 0.950 |
| | | <hr/> \$3.437 |

The cost of drifting was \$6.56 per foot; of cross-cutting, \$5.44; of raising, \$4.65; of sinking winzes, \$11.92; and of diamond-drilling, \$3.28. The average assay value of the ore mined was \$14.57 per ton. The recovery was a trifle over 90%, and the milling cost \$3.75, to which should be added 15c. for mill construction. The total cost of bullion was 55c. per ounce, and the price realized was 72 cents.

| The following summary of expenditures is given: | | |
|---|--------------------------|------------------|
| | Cost for 41,692 tons. | Cost per ton. |
| Mining | \$144,677.01 | \$3.470 |
| Development | 68,588.90 | 1.645 |
| Shipping and selling... | 3,556.49 | 0.086 |
| General maintenance .. | 6,793.38 | 0.163 |
| *General expense | 18,403.31 | 0.441 |
| | <hr/> \$242,019.09 | <hr/> \$5.805 |
| Milling | \$186,348.36 | \$3.762 |
| Mill construction | 7,432.04 | 0.150 |
| **Custom milling | 5,891.50 | 0.119 |
| Royalty | 5,211.00 | 0.105 |
| | <hr/> 204,885.90 | <hr/> 4.136 |
| | <hr/> \$446,901.99 | <hr/> \$9.941 |

*Office salaries, etc.
**Handling custom ore from cars to ore-bin.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

CONTRACT OF SALE OF MINES—CONSTRUCTION.

A contract for the sale of certain mines permitted the purchaser to develop the mines, and provided that part of the proceeds should be paid on the purchase price. Under the agreement the purchaser was allowed \$12 per ton for ore treated on the premises, and that on ores better adapted for shipment directly to a smelter a further allowance was to be made. On a disagreement and a dispute as to whether the purchaser was entitled to the \$12 per ton on ore shipped to the smelter the construction put upon the contract by the parties themselves and by the purchaser on the deposit of a deed in escrow was said to control; and it was immaterial whether such construction was regarded as a modification of the contract or an interpretation thereof.

Powers v. Worlds Fair Min. Co., (Ariz.) 100 Pac. 955, March '09.

CONTRACT FOR SALE OF MINES—PAYMENT AND POSSESSION.

A contract for the sale of mines permitted the purchaser to take possession and develop such mines, and provided that part of the proceeds should be paid on the purchase price by depositing in a bank the net proceeds from the sale of the ore within 15 days after receipt thereof, and on his failure to do so the deed placed in escrow should be returned. In an action for damages for dispossession on the failure to make such deposit, the court decided that the contract was entire and that the purchaser's right to remain in possession of the mine depended upon the deposit of the proceeds of the ore as required.

Worlds Fair Min. Co. v. Powers, (Ariz.) 100 Pac. 957, March '09.

LOCATION OF MINING CLAIM—RECORDING NOTICE.

The statute of Alaska includes in its provision the recording of notice of mining location. But the following provision, "provided notice of location of mining claims shall be filed for record within 90 days from the date of the discovery of the claim described in the notice," was held not to require, but merely permitted the recording of such notice; nor did it provide that the failure to provide such notice should work a forfeiture of rights; and such a forfeiture does not follow in the absence of a well-established rule or custom of the miners of the district to that effect.

Sturdevant v. Vogal, 167 Fed. 448, Feb. '09.

LOCATION OF MINING CLAIM—EFFECT OF ERROR IN NOTICE.

An error in the location notice of a mining claim in its reference to the location of a permanent monument, was held not material in an action between the original locator and the subsequent locator, where it was shown that the claim was properly marked by stakes, and where it further appeared that such subsequent locator never saw the notice and could not have been misled thereby.

Sturdevant v. Vogal, 167 Fed. 448, Feb. '09.

MINING CLAIM IN FOREIGN COUNTRIES—APPLICATION OF STATUTE.

The United States statutes governing the rights of co-owners of mining claims where a part of such owners have done all the assessment work thereon, have no application to mining property situated in a foreign country.

Gaines v. Chew, 167 Fed. 630, Feb. '09.

DEED—RESERVATION OF MINERALS.

In a deed conveying certain lands a reservation of 'all minerals' was held to include petroleum, oil, and gas.

Weaver v. Richards, (Mich.) 120 Northwest. 818, Apr. '09.

Dividends.

On Monday, October 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 145 of \$45,000. This makes the amount of dividends paid since January 1, 1909, \$525,000, and the total to date \$11,196,000.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

THE MINING LAW OF CANADA By Alfred B. Morine. pp. 338, index. The Cromarty Law Book Co., Philadelphia, 1909. Price \$7.50.

The appearance of this work on Canadian mining law is most opportune in view of the fact that more than 10 years have elapsed since the publication of a similar treatise. The author has made the following division of his subject: (1) Mining Terms and Phrases; (2) Laws in Force (Dominion and Provincial); (3) Crown Title and Minerals under Railways, etc.; (4) Rights of Owners, Right to Let or License, Dower, Partnership; (5) Contracts; (6) Licenses and Leases; (7) Easements and Fixtures; (8) Taxation and Registration; (9) Wrongful Abstraction and Criminal Offences; (10) Employers' Liability. An appendix contains the mining regulations applicable to Dominion lands, and the statutes of those provinces in which mining transactions are now most active. To the student of American mining law this work will prove of great interest as a comparative study. While the absence of the extra-lateral right tends to simplify the mining jurisprudence in Canada, there is the same complexity and confusion that exists in the United States owing to the fact that most of the provinces in Canada have their own individual statutes, while there are still other regulations applicable to Dominion lands. It is interesting to note the frequency with which American cases are cited, owing to the fact that many of the points discussed by the author have never been presented to the Canadian courts for determination. The fact that the law relating to mines in Canada has not assumed the importance there nor been brought before the courts for determination with the frequency that has been the case in this country, has enabled the author to devote a considerable portion of the work to a consideration of related subjects of a less specialized nature, such as the law of contracts in all its aspects, employers' liability, easements, fixtures, and others. Because of the elaborate nature of our mining jurisprudence the treatment of the subject of mining law in this country is usually confined to an exposition of specialized features only, of such general subjects. Mr. Morine's work is a valuable addition to the literature of Canadian mining law.

TIMBERING AND MINING. A TREATISE ON PRACTICAL AMERICAN METHODS. By William H. Storms. 8vo., 280 pp., ill., index. McGraw-Hill Book Co., New York, 1909. Price \$2.

Mine timbering is strictly and absolutely an art; it is a development from experience, and cannot be reduced to scientific rules capable of mathematical expression. The pressures and even the directions of the strains which the miner has to meet are usually unknown and unascertainable. Nevertheless, the safety of mining to a large extent reduces to reliance upon the adequacy of the timbering. Hence the study of methods found suitable is of the highest importance. Mr. Storms has devoted long attention to this subject, and has collected a large amount of data, put together in book-form, making a work which will be widely appreciated. He discusses timber and its preservation, proper forms of sets for drifting, under all conditions; comparison of structural steel with timber for underground use, special applications of timber to gravel-mining; shaft timbering; simple head-frames; details of framing; station timbering, and so forth; all elucidated with well-executed illustrations. Stopping and stope-supports are treated in large detail. Mr. Storms has also undertaken to describe methods of mining, and the descriptions of the systems practiced at Broken Hill, New South Wales, and at the Homestake mine in South Dakota, are of peculiar interest and value. The account given of caving methods, however, is most inadequate, a criticism which must be made of every published description of such procedure. There is room for a special treatise on this subject. The hints given on caving in this volume are suggestive and useful as far as they go. We do not hesitate to say that this work is one of genuine practical utility and should be read by every mine superintendent.

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TABLE OF CONTENTS.

| | |
|--|-------|
| EDITORIAL: | Page. |
| Notes | 509 |
| Mr. Taft's Conservation Policy..... | 510 |
| Recall of Mr. Crane..... | 511 |
| GENERAL MINING NEWS..... | 513 |
| SPECIAL CORRESPONDENCE | 518 |
| CONCENTRATES | 538 |
| DISCUSSION: | |
| Discovery of the Great Comstock Mine..... | |
|R. H. Campbell | 524 |
| Wilfley Tables as Classifiers..... | |
|Bertram Hunt, H. W. Reed | 524 |
| A Vein and Its Apex..... | |
|J. W. Finch | 525 |
| ARTICLES: | |
| Patenting Mineral Land..... | |
|George A. Packard | 526 |
| Iron-Ore in Cuba..... | 528 |
| Pan-Amalgamation Experiments | |
|H. O. Hofman and C. R. Hayward | 529 |
| Minerals in Alsace-Lorraine..... | 533 |
| The Arkansas Diamond Fields..... | |
|Austin Q. Millar | 534 |
| Sampling Methods | |
|J. M. Camp | 535 |
| Vara Conversion Table..... | 537 |
| Spirit Leveling | 537 |
| Resolutions Adopted by the American Mining Con- gress | 539 |
| Pacific Stem Guides | 540 |
| DEPARTMENTS: | |
| Personal | 512 |
| Market Reports | 512 |
| Commercial Paragraphs | 540 |

EDITORIAL.

BRITISH engineers are said to be making surveys of Bering Strait to determine the feasibility of a railway tunnel. Nome is likely, however, to continue to depend on steamers for some time.

DISCOVERY of quicksilver deposits in a new locality, fifty miles east of Terlingua, Texas, and thirty miles north of Boquillas is announced. While cyanidation has seriously cut the profits in quicksilver mining the occurrence is none the less important as indicating mineralization of territory additional to that previously known.

PRODUCTS of the mines furnished 83 per cent of the traffic of the Denver & Rio Grande railroad in 1908. Of this amount 40 per cent came from ores and 28 per cent from bituminous coal. The former yielded approximately two million dollars revenue, and the latter three and a half million. If it were not for the mines and the tourists the Rio Grande would not earn expenses.

TIN deposits have been known near El Paso, Texas, since 1899, though no especially vigorous attempt has been made to develop them. The organization of a new company with adequate capital is announced, and shaft-sinking is to be begun at once. The importance of securing additional deposits of tin fully warrants careful exploration of ground even less favorably situated than that in the Franklin mountains, and it is to be hoped that success will crown the new venture.

PETROLEUM of light gravity has been discovered in the Philippines on Tayabas peninsula. Mr. George I. Adams has recently examined the wells and sampled the oil. He considers the showing fully as encouraging as those which led to the development of several fields in the United States. High-grade petroleum from this field would find a ready market for refining in California, where oil from Sumatra is now imported for mixing with lower grade local material.

THE Alaska Central railroad, which is built from Seward to Turnagain arm, was bought in at receiver's sale by Mr. S. G. Jemmett for J. P. Morgan & Co. The same firm, with associates, is building the Copper River & Northwestern railroad from Cordova to the Bonanza mine. The Alaska Central was originally financed by the Sovereign Bank of Canada. The failure of that institution left the future of the road uncertain. It is announced that contracts will be immediately let to extend the Central to the coal fields. The original entrance of the

Morgan interests into the territory argued well for the confidence which it inspired. That additional property should be purchased after personal examination by Mr. G. W. Perkins indicates that abundant capital is to be forthcoming for the development which the region needs.

DEFINITIONS are ever a matter for dispute, but agreement as to them settles many a vexatious question. In this issue Mr. J. W. Finch presents certain definitions for consideration and comment. He endeavors to harmonize as far as may be the differences between the point of view of the observer interested only in the scientific aspects of ore deposits, and that of the lawyer concerned with what one might paraphrase as the 'legal entity' of an ore deposit. This Mr. Finch is particularly qualified to do, but the subject is broad, and further discussion will be welcome.

FESTIVITY will become the serious concern of the San Franciscan throughout the coming week. He is always a festive person, vaunting his Bohemianism, preaching and practising the doctrine that business should not deny the right to pleasure. The special occasion is that of celebrating the one hundred and fiftieth anniversary of the discovery of San Francisco Bay by Gaspar de Portola. Nobody knows how to pronounce his name; the plain man calls it Portóla; the elect insist on Portolá, which sounds elegant; and the ultra-fastidious have secured a decision from the Spanish Academy in favor of Pórtola. If the pictorial forecasts of what is coming should be verified nobody would be able to pronounce it at all by the end of the week, so the importance of the matter dwindles. The great point is that a week of fun and commercial activity seems assured.

REVOLUTION is reported from Nicaragua. Señor Juan J. Estrada is said to have assumed the executive authority in disregard of President José Santos Zelaya. Color is lent to the accuracy of the dispatch from the statement that President Zelaya was at Cape Gracias á Dios at the time. This is in the extreme northeastern corner of the country, from which point speedy return to the capital would be impossible. So far as geographical position is concerned he could not have been taken at greater disadvantage. President Zelaya is reputed to have kept his bank account in Paris, a special train under steam near the palace in Managua, and a fast yacht waiting at Corinto. Evidently he must have been growing bolder to sacrifice his strategic situation by a journey to the far off cape which he would now hardly name so generously and devoutly as did Columbus, to whom it owes its title. A change in régime at present might fittingly usher in the new era of development that seems to be dawning. The equipment on a splendid scale of the Leonesa mine near Matagalpa by the Oroya-Brownhill Company, and the purchase by the same powerful corporation of the Babilonia mine in the Libertad district, have attracted attention afresh to Nicaragua, the stimulus of which has been felt in every mining camp of the Republic.

Mr. Taft's Conservation Policy.

Of the President's speeches none has attracted more attention in the West than that made at Spokane, in which he discussed his attitude toward conservation. The West has peculiar interest in this subject, since here are the great areas of public land over which alone the Federal Government has the authority of ownership; and for the solution of many of the problems of conservation ownership is essential. At present the United States holds important forest lands, water-power sites, and mineral lands; especially those underlaid by coal, oil, and phosphate deposits. It has in addition immense arid and semi-arid agricultural lands, but concerning them the National policy is well settled; the purpose being to get them as rapidly as possible into the hands of actual settlers, and as a means to that end to improve them by irrigation before sale where necessary. In regard to the other lands, conditions are less settled. In the past there has been little attempt to discriminate, and in valuing them acreage has been the principal element. There is now no law by which a water-power site may be sold by the Secretary of the Interior on any different terms than other lands. Yet it is clear that such a site is in most cases of much more value than an adjacent tract of desert, or even unprospected but presumably mineral-bearing land. What the public is coming to believe, also, is that there are the best of reasons why public policy should require that this land, if sold at all, should be sold under conditions which will protect the people against possible extortion by a private monopoly.

Mr. Taft's policy seems to contemplate a considerable change in the laws governing the public lands. The forest lands he believes should be retained and protected, as already provided, only the forest products being sold. The power-sites should be sold, but under restrictions as to their use. In the case of coal, oil, and phosphate lands, surface rights should be separated from mineral rights, the mineral should be valued not by acreage but by quantity and quality, and the lands either retained and leased on a royalty basis, or sold subject to restrictions designed to prevent monopoly. Whether a similar policy will be later recommended regarding other mineral lands no hint is given. Mr. Taft makes entirely clear that all this cannot be accomplished without additional legislation, and he recognizes that the present withdrawals of land are temporary and can only hold until Congress shall have had an opportunity to consider and act. The responsibility rests, therefore, squarely on Congress. Evidently the President anticipates legislation favorable to the policy he has outlined, and certainly if any faith is to be put in political bargains, Congress should give him what he asks in return for his defense of the tariff bill. Congress, however, has a way of its own, and is influenced mainly by what its leaders estimate to be insistent public opinion. Many will find reason to oppose the policy the President has outlined.

There can be no doubt that there is in the West as well as in the East, a deep-seated distrust of monopoly and a disinclination to allow any more of the essentials of life and civilization to pass into

monopolistic control. The economic advantage of centralized control of an industry is discounted by the well-grounded public distrust of the altruism of big business men or the effectiveness of public control of the great inter-state 'trusts'. This feeling has given rise to a multitude of anti-monopoly laws, both State and National. Many of these have been unwise, and the harmful character of the legislation is widely recognized; yet public opinion prevents its repeal. This distrust of monopoly is a strong, if not controlling factor in the situation. In the second place, there is a general social as well as individual interest in the 'unearned increment', and the public has a growing conviction that a part at least of this justly belongs to society as a whole, rather than to somewhat fortuitously selected individuals. No one wants power-sites for what they now are, but for what they may become. The unimproved waterfall does no work, but the public is beginning to feel that its potential dividends for all time to come are at least as valuable as the works which may be built to develop the power. In the case of mineral land this attitude is shown in the general approval of the course of the Government in changing the method of valuation of coal lands from one based on acreage to one based on tonnage. This appeals to the common sense of the man in the street. If a thing is to be sold, why not for a consideration at least approximating its value?

Opposed to these two favoring currents of public opinion are others especially strong in the West. The first and most important is a fear of anything which may retard development. Every city and town in the West has an almost morbid interest in its own growth in wealth and population. Commercial rivalries are keen and 'booming' is a fine and widely practised art. So determined are Westerners to do all that can be done to develop the country at a maximum rate, that neither individually nor collectively is there any hesitation to mortgage the future if need be. The East did it in the years gone by, and the West looks at the results, balances the profit and loss, and is willing to follow the example set. If a street-car line can only be obtained on the basis of a perpetual franchise, it will none the less be built, though the builders of the West try to profit by the mistakes of their fathers in the older States, and they usually succeed. Nevertheless, if any conservation policy seriously check development, Western sentiment will be found to set stubbornly against it.

A second sedulously cultivated opinion is that the conservation policies will result in exploiting the West for the benefit of the East, the latter having already recklessly wasted its own resources. There seems to us little merit in this contention, and if the first objection be met, if continued development be assured, we believe the West will be found solidly behind the President in his recommendation to Congress.

The forestry policy is settled. The change has produced some hardship and much irritation in the areas covered by the National Forests. We believe that there will be, as there should be, a decrease in the rigor of the administration of the forests, and that as the boundaries are rectified much of the friction

between the Forest Service and the public will disappear. The establishment of a leasing system for the public coal and oil lands should be easy, since coal and oil operators are generally accustomed to work on a royalty basis. The separation of surface from mineral rights is also but a return to first principles in much of the West, and will allow a prompt development of much ground which otherwise would long lie idle. The main contest will doubtless be in regard to power-sites and water-power. Public opinion regarding these is not well informed, and we believe that there is as yet no consensus as to what should be undertaken. On the whole, Mr. Taft has laid out a broad, consistent policy; one which deserves, as it will doubtless receive, general public support, and we believe that nowhere will support be more hearty or more sincere than in the West where there is most to gain or lose by conservation.

Recall of Mr. Crane.

The dismissal of a minister-designate before he had left the shores of his own country is a rare occurrence. It is spectacular, and humiliating for both the individual and the Government. Mr. Charles R. Crane had ventured to express opinions concerning the action of the United States in demanding and securing a portion of the Hankow-Sze-Chuen railroad loan, which was effected through the able instrumentality of Mr. Henry P. Fletcher, chargé d'affaires at Peking; and worse still he presumed to affirm a hostile attitude on the part of the Washington Government toward the recent treaty between Japan and China. Mr. Crane says in his defence that his utterance "contained nothing of substance that was not deducible by any competent newspaper reporter from facts commonly known," and he objects again that "I assumed the President wished me to discuss realities and not platitudes." Mr. Crane has further vindicated the action of Secretary Knox by these statements. Matters "deducible from facts commonly known" lack the force of an official announcement; it is as different as potential is from kinetic energy. Until time for the Government to act with the full force of national might it cannot sacrifice the value of veiled negotiation. President Taft wished the new minister to educate the people, but Mr. Crane seems to have assumed that educating them meant to inform them of the inner mysteries.

The mistake made was in going outside of the diplomatic service for the incumbent of a post where the utmost skill is needful. The Oriental situation is like a dynamite magazine; the least indiscretion may produce a disastrous explosion. No better trained diplomats exist than those gathered in the East, men who know the game in its finest subtleties. Several wise men declined the post; Mr. Crane would have been wiser had he followed their example; Mr. Knox may now show judgment in sending a man with the previous experience needful for so delicate a mission. The advantages of the growing commercial, mining, and manufacturing importance of the East may be gained to us by careful conduct of diplomatic relations; while a false step might hopelessly prejudice our opportunity.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

HOWARD D. SMITH is in London.

E. J. SWEETLAND has left Los Angeles for Mexico.

JAMES W. ABBOTT was recently at Salt Lake City.

H. S. KENNEY has sailed from Durban, Natal, for New York.

WILLIAM PORTER WISE, of Bisbee, Arizona, is visiting San Francisco.

PHILIP FOSTER is examining the Campo Morado, in Guerrero, Mexico.

C. W. PURINGTON will leave Nikolalevsk, Siberia, for London, October 20.

GEORGE WEBBERS, of the Robinson Deep, has been visiting at Berkeley, California.

R. C. RUCKER has arrived from Ecuador and will proceed to Johannesburg, South Africa.

D. E. SHERWOOD, formerly of Nevada, has opened an office in the Hooper Bdg., Salt Lake City.

F. H. MOFFIT, S. R. CAPPS, and ADOLPH KNOPF have returned to Washington from Alaska.

J. W. NESMITH visited several of the mills and smelting plants of Salt Lake valley last week.

C. W. WRIGHT is at Iglesias, in Sardinia, as consulting engineer to the Sociedad di Pertusola.

E. L. STENGER, recently testing engineer of the U. S. Geological Survey, is at Bellingham, Washington.

C. H. WRAY is examining the San Juan mine, Libertad district, Nicaragua, for the Oroya-Brownhill Company.

ROWLAND FEILDING, on his return from Siberia, went to Sweden to investigate the electric smelting of zinc-lead ores.

WILLIAM KIDNEY, of Montana, is superintendent of the new copper concentrating plant of the Ohio Copper Co. at Lark, Utah.

C. E. MORRIS, manager of the Santa Francisca mine, Department of León, Nicaragua, is returning to his post from a visit in London.

C. S. HERZIG is returning to Nicaragua from London. He will examine the Javalí and Escandalo mines, in which he may acquire an interest.

C. W. SAXMAN, formerly general manager for the Yampa Smelting Co., and the Tintic Mining & Development Co., has opened an office as consulting engineer at Salt Lake City.

EDWIN HIGGINS has resigned as assistant editor of *The Engineering & Mining Journal*, and will open an office as consulting engineer in the Central Bdg., Los Angeles, California.

T. R. DRUMMOND, former manager of the Newhouse properties in Beaver county, Utah, has taken the position of general manager for the Inspiration Copper Co., Globe, Arizona.

A. W. HUDSON has been transferred from the position of metallurgist of the Great Cobar, Ltd., New South Wales, to that of manager of the electrolytic and smelting plant of the same company at Lithgow.

Dividends to be paid shortly by three mining companies operating in the Goldfield district will amount to a total of \$1,263,000. Of this amount the Goldfield Consolidated Mines Co. will pay to its stockholders on October 31 the sum of approximately \$1,065,000, or 30c. per share; the Florence Goldfield Co. between October 25 and November 1 will distribute 10c. per share upon its outstanding stock, or \$105,000, and the Combination Fraction Mining Co. will pay a 10c. dividend, disbursing \$92,000 on November 5. A carefully compiled table of the profits paid by mines in the Goldfield mining district in five years, including those mentioned above, credits the camp with net profits of \$14,388,786. This does not include profits made by some of the leases operated by close corporations and does not take into ac-

count cash reserves now held by producing companies. The Consolidated will have in its treasury after the payment of the forthcoming dividend over \$2,000,000, the Florence and Combination Fraction each considerably more than \$100,000. Total payments by the three leading mines to November 1 are: Consolidated, \$3,901,624; Florence, \$630,000; and Fraction, \$92,000, on company account alone.

Latest Market Reports.

METAL PRICES.

San Francisco, October 14.

| | | | |
|---------------------------|------------|---------------------------|---------|
| Antimony | 12-12½c | Quicksilver (flask) | 45-46 |
| Electrolytic Copper | 15½-16½c | Spelter | 7-7½c |
| Pig Lead | 4.65-6.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|----------------------|-------|----------|-----------------|
| Oct. 8 | 12.75 | 4.21 | 5.50 | 51½ |
| " 9 | 12.75 | 4.21 | 5.50 | 51½ |
| " 10 | Sunday. No market. | | | |
| " 11 | 12.75 | 4.21 | 6.02 | 51½ |
| " 12 | 12.68 | 4.21 | 6.03 | 51½ |
| " 13 | 12.68 | 4.21 | 6.03 | 51 |
| " 14 | 12.68 | 4.21 | 6.07 | 51 |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Oct. 7. | Oct. 14. |
|--------------------|---------|----------------|
| | £ s. d. | £ s. d. |
| Camp Bld. | 1 9 9 | 1 9 6 |
| El Oro. | 1 5 0 | 1 5 7½ |
| Esperanza. | 3 0 7½ | 2 17 0 ex div. |
| Dolores. | 1 5 0 | 1 5 0 |
| Oroville Dredging. | 0 14 0 | 0 13 6 |
| Mexico Mines. | 6 8 9 | 6 13 9 |
| Tomboy. | 0 19 4½ | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices, Oct. 14. | | Closing prices, Oct. 14. | |
|-----------------------------|----------|-----------------------------|----------|
| Amalgamated Copper | ..80% | La Rose | 6½ |
| A. S. & R. Co. |96 | Mason Valley | 1½ |
| Boston Copper |14½ | Miami Copper | 15 |
| B. C. Copper Co. | 6½ | M. Co. of America | ½ |
| Butte Coalition |24% | Montgomery Shoshone | .. 1½ |
| Cumberland-Ely | 7 | Nevada Con. |23¾ |
| Davis-Daly | 5½ | Nevada Utah | 1½ |
| Dolores | 7½ | Nipissing |11¼ |
| El Rayo | 2½ | Ohio Copper | 4½ |
| Ely Central | 2½ | Ray Central | 2½ |
| First National | 5½ | Ray Con. |18½ |
| Giroux | 8½ | Tuolumne Copper | 4½ |
| Guanajuato Con. | 2 | United Copper | 9½ |
| Inspiration | 6½ | Utah Copper |47½ |
| Kerr Lake | 8½ | Yukon Gold | 5 |

COPPER SHARES—BOSTON.

| Closing Prices. October 14. | | Closing Prices. October 14. | |
|--------------------------------|-----|--------------------------------|------|
| Adventure | 57½ | Mohawk | 59½ |
| Allouez..... | 58 | North Butte | 59 |
| Atlantic..... | 11½ | Old Dominion | 51½ |
| Calumet & Arizona | 99¾ | Osceola | 156½ |
| Calumet & Hecla | 635 | Parrot | 30 |
| Centennial | 98¼ | Santa Fe | 17½ |
| Copper Range | 79 | Shannon | 15½ |
| Daly-West | 8 | Superior & Pittsburg | 15½ |
| Franklin | 16½ | Tamarack | 65 |
| Granby | 96 | Trinity | 11 |
| Greene-Canaan, ctf. | 10½ | Utah Con | 43¼ |
| Isle Royale..... | 25½ | Victoria | 3¾ |
| La Salle | 14½ | Winona | 7 |
| Mass | 6½ | Wolverine | 146 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 14.

| | | | |
|----------------------------|-------|-----------------------------|-------|
| Atlanta | \$ 12 | Midway | \$ 19 |
| Belmont | 75 | Montana Tonopah | 91 |
| Booth | 12 | Nevada Hills | 75 |
| Columbia Mtn | 10 | Ophir (Comstock) | 240 |
| Combination Fraction | 75 | Pittsburg Silver Peak | 66 |
| Daly | 8 | Rawhide Coalition | 20 |
| Florence | 2.90 | Rawhide Queen | 23 |
| Goldfield Con | 6.85 | Round Mountain | 65 |
| Gold Keweenaw | 7 | Sandstorm | 8 |
| Great Bend | 6 | Silver Pick | 12 |
| Jim Butler | 13 | St. Ives | 8 |
| Jumbo Extension | 14 | Tonopah Extension | 53 |
| MacNamara | 29 | Tonopah of Nevada | 7.00 |
| Mayflower | 13 | West End | 26 |

General Mining News.

ALASKA.

(Special Correspondence).—The Unuk River Mining & Dredging Co. is working a large force of men developing its quartz and placer properties on the Unuk river. J. W. Daley is manager.—D. B. Strong, representing Eastern capitalists, has secured an option on the Shellhouse and California group of claims on Dall island, off the west coast of Prince of Wales.—A freight barge is loading 2500 tons of ore from the Goodroe mine, Kasta bay. The ore is copper and gold, and is the first large shipment from this property.—The It, Mount Andrew, and Salzer mines are making regular shipments.

Ketchikan, October 1.

The gold medal for the best exhibit and photograph of gold-silver ore was awarded to the Alaska Perseverance Mining Co., operating the Alaska Perseverance mine, near Juneau.—Navigation on the Tanana river was closed by a sudden freezing of the stream. Several vessels were caught in the ice and will be held there till spring. A thousand tons of freight for Fairbanks has been tied up and will not arrive at its destination till next May.

ARIZONA.

COCHISE COUNTY.

Work has been started at the Black Queen property in the Paradise district which is under bond to Renwick White. The 263-ft. cross-cut will be advanced to intersect the limestone-felsite contact, on the surface of which considerable copper carbonate has been opened.—The Calumet & Arizona Mining Co. made the final payment of \$1750 on the April Fool claim in the Courtland district. The company has sunk a 500-ft. shaft on the property and is to install a heavy pumping plant while cross-cutting.—The smelter of the Wein Commercial company at Johnson was blown-in this week. H. S. Wein is manager.

GILA COUNTY.

The shaft at the property of the Cole Development Co., of Globe, has been unwatered and sinking resumed at the 320-ft. level. A vein of high-grade copper has been opened at the mine and several large bodies of concentrating ore. The Sullivan shaft, at the Cordova property, is down 500 ft., and cross-cutting started to open the ore found above.—The Miami extension of the Gila Valley railroad was completed to the site of the Miami Copper company's concentrator. The construction has been hurried, as a large amount of material for the concentrator has been sidetracked awaiting the building of this spur.—The Gibson Copper Co. is installing a power plant at its property in the Globe district.—The surface plant at the Superior & Boston company has been completed and the company will commence shipping ore by the first of the year.—The Black Warrior company is now shipping 110 tons of ore per day to the El Paso smelter. The Winnie shaft is being unwatered and sinking and cross-cutting will be resumed at the 250-ft. level.—The Ray Consolidated Copper Co. has expended \$125,000 lately in purchasing ground for a smelter site at Winkelman and has started a force of men clearing the land and grading for a spur to the railroad. The London-Gila Mining & Power Co., in the same district, has resumed work in its adit.

GRAHAM COUNTY.

The Archise Copper Co. has resumed operations at its property ten miles north of Safford in the Gila mountains.—Two Keystone drills arrived at Clifton on the way to the properties of the Copper Mines Co. of America. One drill will be placed on the Keystone, the other on the Celtic group.

MOHAVE COUNTY.

(Special Correspondence).—The Union Basin Mining Co., whose properties are situated in Union Basin district, has its main working shaft down 175 ft., and drifts started on the vein. The development planned is to sink the shaft to a depth of 600 ft., and cross-cut every 100 ft. The mine is

producing 10 tons of ore per day, which is shipped to the smelter at El Paso. A gravity tram has been completed to the wagon road, effecting a saving of \$1.50 per ton in transportation.—The 600-ft. shaft of the Elkhart mine, at Chloride, is to be re-timbered and sinking resumed. The underground workings, of which there are more than 1200 ft., are badly caved. These will be re-timbered and work resumed on the lead-silver ore. The last work done at the mine, before closing down a year ago, opened some carbonates of copper ore which will also be prospected.

Kingman, October 11.

PINAL COUNTY.

A good body of gold-silver ore has been opened recently on the Cloudburst claim of the old Silver King mine.

YAVAPAI COUNTY.

Two cross-cuts are being driven on the 700-ft. level of the Haynes property which joins the United Verde mine on the north. T. E. Campbell is manager.—By paying \$8000 to Fred W. Williams, H. J. Beemer completed the installments of his \$58,000 option on the Storm Cloud mine, 12 miles south of Prescott. The main development is a 1200-ft. drift on the Storm Cloud vein exposing a copper-gold ore that assays from \$25 to \$40 per ton. There are 15 claims in the group, and several shipments to the Humboldt smelter, more than covered the cost of mining and shipping. As soon as this smelter resumes operations shipments will be forwarded from the mine.—The shaft at the Monroe mine near Huron has been stopped at a depth of 170 ft., and drifts started on a vein of black oxide copper ore. Several shipments have been made to the smelter at Needles. C. P. Wingfield is the owner of the property.—The Peacock Mining Co., operating ten miles south of Prescott, has let a contract to sink its shaft 800 ft. This will make a total depth of 1025 ft.—The 300-ft. shaft at the Marcus mine, in the Weaver mountains, has been unwatered by T. J. Morrison, and a body of sulphide ore opened. The ore from the upper levels of the mine was worked in early days by an arrastre for its gold and silver content and several shipments made to the smelter.—At the property of the Golden Ridge Mining & Milling Co., the vein is 10 ft. wide, and assays \$8 per ton. Eli S. Perkins is manager.

YUMA COUNTY.

The cross-cut adit at the Harcuver Copper Co.'s property in the Cunningham Pass district is in 325 ft. and is expected to cut the ore within the next 100 ft., giving a vertical depth of 270 ft. An official survey has been made of the claims, and application for a patent will be made some time this month.—A body of high-grade copper ore was cut on the 100-ft. level of the Little Butte mine at Bouse. The shaft is now down 275 ft., and will be continued to the 500-ft. level with cross-cuts to the orebody at the 300.

CALIFORNIA.

NEVADA COUNTY.

New machinery is to be installed, a surface plant constructed, and work resumed at the Yuba mine, near Maybert, which is owned by the Yuba Gold Mining Co.—The 30-stamp mill at the Erie mine, near Graniteville, is to be started this month. R. G. Eckis is manager.

SHASTA COUNTY.

The Stauffer Chemical Co. has taken a \$10,000 bond on the Oro Fino mine near Shasta. The bond runs for one year, and it is the intention of the company to erect a 5-stamp mill on the property.—The Mammoth Mining Co. is to sink the double-compartment shaft at the Quartz Hill mine an additional 100 ft., making a total depth of 273 feet.

SIERRA COUNTY.

The cross-cut at the Bunker Hill mine, near Downieville, under bond to Breese & Hood, opened the channel. No driving has been done, so the extent of the find is unknown.—The company operating the Kate Hardy mine, near Forest, is opening a 20-ft. vein of high-grade milling ore. It is probable that a mill will be erected in the spring.—A small furnace has been built to roast the sulphide concentrate at the Sailor Ravine mine, in the Downieville district, operated by Frye & Winrod.

SISKIYOU COUNTY.

The Yellow Butte Mining Co., operating east of Weed, has been re-organized, and work will be resumed at the property.

TUOLUMNE COUNTY.

An 18-in. vein has been cut near the surface in the Keltz mine.—The cross-cut on the 300-ft. level of the Black Oak property opened a 3-ft. vein of shipping ore.—It was stated by Bert Clark that the shaft on the Clark Brothers' ranch, in the Sonora district, is down 40 ft. on a 3-ft. vein, 6 in. of which is good shipping ore. A horse-whim is to be installed and the shaft sunk to the 100-ft. level before any lateral work is started.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—An important mining deal was closed last Saturday in the office of the Boyce-Mouat Engineering Co., Denver, when the Bellevue-Hudson group of 14 lode mining claims, tunnel and mill-sites was purchased by the Southwestern Mines Corporation, of Boston, for a reported consideration of \$150,000. M. W. Mouat, the Colorado manager, states that the Bellevue-Rochester adit, which is known as the ninth level, will be advanced at once 5600 ft. This will intersect the Dictator, Mogul, Prince Albert, Kohinoor, Drummond, American Sisters, Jo Reynolds, and Lamartine veins, the combined production of which exceeds \$9,000,000. A winze is to be sunk 400 ft. from the ninth level, and cross-cuts driven from each 100-ft. station. This will put the heading of the lower workings under the ore-shoots on the Anampsa vein. A 100-ton concentrating plant and 10-drill compressor will be installed, the equipment having been ordered from the Colorado Machinery & Supply Co., of Denver. With the shaft sunk the proposed depth of 400 ft., the Bellevue-Hudson will be the deepest worked mine in the silver-lead district of Clear Creek county.—A promising find was made last week in the Golden Glory adit at Saxon mountain, when in 610 ft. A streak of mixed ore and quartz was cut that is from 6 to 8 in. wide. H. A. Shipman is consulting engineer. An electric hoist is being installed at the bottom of the raise in the Scepter adit on Democrat mountain that is being put through to connect with the Sunburst workings above, and will be used to hoist timbers. A. B. Montgomery, of Denver, is manager.—Work has been started advancing the sixth level of the Mineral Chief property, and a body of milling ore is being followed that is from 6 to 9 ft. wide. Within two weeks it is expected to have the connection made between levels No. 6 and 5, at which time shipments of smelting ore will be started. C. E. Pughe is manager.—The Crescent 20-ton concentrating plant is to be started on day and night shifts during the present week. During the last two months development has been under way at the New Boston mine, and ample material is now available to insure a continuous supply. The vein of lead-zinc ore measures from 5 to 6 ft. across, and the ground is opened 150 ft.—B. J. Martelon, manager for the Argentine Exploration Co., operating the Mammoth mine on Sherman mountain, is shipping ore to the Mendota mill. The aerial tramway is in good condition and the output will be increased to 50 tons per day by the end of the month. The Black Prince adit, on Pendleton mountain, has intersected another vein, which is supposed to be the extension of the Ontario. Frank Winters is manager.

Georgetown, October 9.

LAKE COUNTY.

The Progressive property, in the Leadville district, has been unwatered and a cross-cut started from the bottom of the 300-ft. shaft to cut the ore. A year ago lessees opened a vein that ran 50% lead, 325 oz. silver, and \$1 gold per ton, but were forced to abandon the work on account of poor financial condition. Howard B. Collins is manager.—George Champion and associates, operating the Little Bob property under lease, are prospecting to find the extension of the shoot recently cut by the St. Louis adit.—The Little Evelyn Mining Co. is shipping 20 tons per day from its lease on Breece hill. Drifts are now being run on a vein cut by the 200-ft. winze from the adit level.

SUMMIT COUNTY.

Arrangements are being made by Mr. Detwiler and associates, of Breckenridge, to resume operations at the C. & S. property on the upper Blue river.—The Continental Chief Mining Co. and the Mint Mining & Milling Co. have consolidated and will operate under the name of Ophir Mountain Consolidated Mines Co. The properties are two miles south of Frisco, and have been opened by about 1300 ft. of development. Conrad Henneck, of Frisco, is superintendent.

TELLER COUNTY.

The return on 24 tons shipped by Joseph Brentlinger and associates from the property of the Old Gold Mines Co., on Beacon hill, amounted to \$52 per ton.—John Wood, of Cripple Creek, has secured a two years' lease on the K. P. claim of the Western Union Mines Co. on a royalty of 10% the first year and 15% of the value of the ore marketed the second year. There are 10 acres in the claim and several bodies of low-grade ore have been opened.—The United Gold Mines Co. has given L. S. Cox a lease on the Damon property for two years.—P. E. Murcay is shipping six cars of ore per month that averages \$50 per ton from a sub-lease on the Anchoria-Leland property on Gold hill.—The Vindicator Consolidated Gold Mining Co. declared the regular quarterly dividend of 3c. per share payable October 25. The total amount distributed will be \$45,000.—The September output from the main shaft of the Mary McKinney Mining Co. was 725 tons of \$25 ore. Lessees on other portions of the estate shipped 1500 tons of milling ore.—A new steam hoist is being installed at the Nightingale claim by Milhoun & Mart, who are operating the property under lease from the Stratton company.

IDAHO.

BLAINE COUNTY.

George Z. Edwards has been forced to resign his position as manager of the Cannon Ball mine, 35 miles west of Hailey, on account of several attempts to take his life. Mr. Edwards was formerly superintendent of the Mercur mine in Utah and of the Lincoln mine at Pearl, Idaho, and is considered an efficient manager.

IDAHO COUNTY.

Contracts have been let to double the capacity of the 10-stamp mill at the Crackerjack mine in the Buffalo Hump district. The Crackerjack company is operating on a 30-ft. vein that mills \$6 per ton, the cost of mining and milling approximating \$3 per ton.

OWYHEE COUNTY.

An 8-ft. vein of rich ore has been opened on the Como and Alice No. 2 claims in the Silver City district by Connors & Belcher.—The drift at the Banner property is being driven on a 4-ft. vein and is expected to tap the ore-shoot shortly.—Considerable new electric equipment is being installed at the Rich Gulch mine near Silver City. A. F. Stevens is manager.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—The Herald Mining Co. is sinking a 300-ft. drill-hole. The drill entered ore at 139 ft., and is still in ore at 230 ft. A drift from the shaft has been started in the direction of the new find.—The Ihlsing shaft is down 260 ft. and will be continued to about 300 ft. The ore was reached at 227 ft. Two mills will be built, one on the Ping and the second on the Robertson land.—Oscar De Graff has made a rich discovery on his 360-acre farm near the Badger-Peacock, the drill cutting ore at 150 ft. A contract will be let for a mill in the near future.—Childress Bros., operating in Galena, have secured a new 4-lot lease and will build a mill on the property. The company already operates two plants on well developed leases. Galena, October 11.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The Nashville Tennessee Co., in East hollow, has resumed operations and two of the old drifts have been re-opened. A face 20 ft. high has been disclosed in one, while a face 12 ft. high has been found

in the other.—In the Zincite camp, the old General mine has begun operation again, and is shipping a high-grade concentrate.—The White Swan Co., in the same camp, has just completed a large new mill.—L. A. Cunningham has resumed work at the old Lucky Jim property. The ore is found at a depth of 175 ft.—The B. & C. mine, which has not been worked for several years, is again being operated and a new shaft north of the mill is being sunk.—Mill No. 3, of the Oronogo Circle Co., at Oronogo, has resumed operation after the damage done by fire a few weeks ago was repaired.—One of the richest discoveries made for some time is a lead find on the Murphy land where the ore has been found in bore-holes from 175 to 200 ft.—At the Ino property a new rich orebody was cut in a shaft northwest of the present one at a depth of 135 ft., the ore running 20% zinc. The old Dominion mill will be re-fitted to treat the ore.—Edwards & Schnur have found ore in the third drill-hole sunk on their lease on the Rex land. The deposit is from 58 to 75 ft.—Rich ore has been found in a drill-hole from 80 to 86 ft. on the Pinkard land.—A rich run of galena and blende was cut west of Sarcosie by the shaft on the Rohrer land at a depth of 35 ft.—The new Columbus mill, near the old Bumble Bee mine, southeast of Joplin, is now producing 5 tons of high-grade concentrate per day. The ore occurs at a depth of 142 ft.—The Durby Mining Co., at Prosperity, is to erect a 200-ton mill on the lease of the Ground & Irwin tract.—Gallagher & Gerke are to build a new mill west of Joplin on the sheet ground area. From the shaft 100 ft. of driving has been done already. Thirteen drill-holes have been sunk on the land, opening a uniform deposit which will mill 6% zinc blende.

Joplin, October 9.

NEW MEXICO.

SIERRA COUNTY.

(Special Correspondence).—The Black Range and Apache districts in this county are again coming into prominence after many years of inactivity. Eastern and Colorado capi-



Map of New Mexico.

talists are principally interested and have developed several promising claims. The principal towns of the district are Chloride, Fairview, and Fluorine. The district is reached by stage from Engle on the El Paso branch of the Santa Fe.—A vein of ore assaying from \$60 to \$2500 per ton has been opened at a depth of 145 ft. in the United States Treasury mine. Considerable low-grade ore is being opened in the White Eagle shaft. A boiler, hoist, compressor, and pump were recently installed at this shaft. The company expects to build a mill in the near future.—Ohio capitalists have purchased 100 acres of land lying

near the United States Treasury group. Operations will be commenced soon.—At the Great Republic a 3-ft. vein assaying \$60 per ton gold and silver has been opened by a cross-cut from the shaft. Frank P. Davis is manager.—The Home Mining Co. is installing a Chilean mill.

Chloride, September 30.

NEVADA.

ESMERALDA COUNTY.

The Florence Goldfield Mining Co. has declared a dividend of 10c. per share, payable November 1, the total amounting to \$105,000.—A dividend of 10% amounting to \$93,000, was declared by the Combination Fraction Mining Co., of Goldfield. The company is mining approximately \$50,000 worth of ore per month, and will have over \$100,000 surplus left in the treasury after the dividend is paid.—The cross-cut from the raise on the 730-ft. level of the Mohawk workings of the Consolidated company opened a body of ore that assays from \$1200 to \$1800 per ton. Six 7-ft. Chilean mills are to be added to the Consolidated mill to handle the increased output from the lower workings. The company is to distribute \$1,065,000 dividends on October 31.—The Precious Metals Mining & Milling Co., of Nevada, operating in the Goldfield district, has adopted the policy of having its stock assessable. This is the first company in the district to take this method of financing the development. Many of the companies in Nevada have been handicapped by lack of funds to carry on prospecting and their properties have lain idle.—A shipment of 12 tons was made to the Nevada-Goldfield Reduction Works from the Kansas City Velvet lease, on the old Truitt shaft. The ore assays from \$75 to \$150 per ton.—The Burke lease, on the Belmont property, at Diamondfield, is shipping ore to the sampler that assays from \$150 to \$300 per ton. The cross-cut on the 200-ft. level recently opened a body of ore in which some of the high-grade streaks assay as high as \$3000 per ton.—The Oriole Mining Co., with mines near Mina, has just bought a stamp-mill, power equipment, compressor, and drills. The ore to be treated consists of a free-milling porphyry, and it is expected that no cyanide plant will be required.

NYE COUNTY.

(Special Correspondence).—It is reported that high-grade ore has been struck on the 150 and 330-ft. levels of the Pioneer lease.—Clothier & Gingles recently shipped 41 tons of \$73 ore to Goldfield. The lease is operating on the Denver claim of Tramps Consolidated. The semi-monthly clean-up of the Montgomery-Shoshone mill amounted to approximately \$18,000.—The entire estate of the Bullfrog Extension Mining Co. has been leased to Goldfield people. The Red Star Mining Co. will open the west portion of the Delaware claim, where a 40-ft. body of low-grade ore has been cut at a depth of 125 ft. The east portion of the claim and the Last Chance claim will be worked by the Black Duck and Green Ore Mining & Leasing companies. The 250-ft. shaft will be sunk to the 500-ft. point.—It is reported that the chief stockholders of the West Extension have notified the creditors that all bills will be met as soon as proved.—The extraction from the Manhattan placers is daily increasing. One company has opened excellent gravel in one of the branch benches, which is thought to prove the mineralized district for a considerable distance outside the main gulch.—The Goldfield-Bald Mountain company is in control of the largest acreage in camp, and is employing 24 men. A large portion of the ground has been blocked out and production will soon commence.—The Breyfogle Mines Co. is opening a bed of gravel at a depth of 20 ft. The gravel is 3 ft. thick and runs \$7 to \$8 per cu. yd. An electric hoist and centrifugal pump will be installed.

Rhyolite, October 8.

STOREY COUNTY.

(Special Correspondence).—A vein of gold-silver ore, said to be over 4 ft. wide, with assays from \$50 to \$130 per ton, has been cut by the drift from the 2300-ft. level of the Mexican.—Several lessees have started work on the Ophir and Best & Belcher ground.—On Crown Point a south drift is being driven from the 1100-ft. level. About 250 tons per week of milling ore is being mined on the upper levels and sent

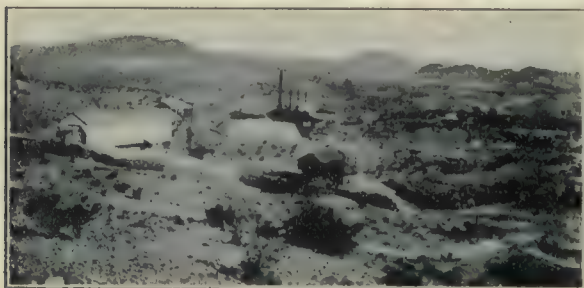
to the Yellow Jacket mill, which is handling from 700 to 800 tons of low-grade ore per week.—At the Overman the No. 3 cross-cut from the north drift on the 1200-ft. level is opening a small quartz vein in unprospected ground.—The joint drift, being extended easterly by the Ophir and Consolidated Virginia companies, is making good progress, and is expected to cut the vein soon. The output of Ophir has fallen materially during the past two months, but the grade is improving, and the management expects to increase the tonnage in the near future.—A one-half interest in the Baker claim, on the Brunswick lode, has been sold to Robert Ingalls, of Olinghouse. The reputed price is \$130,000, \$30,000 cash, to be paid within a year, and the balance expended in development. A force of men will be immediately placed at work.—Despite the handicapping of work, and damage to machinery by the boiling water struck in the Ward shaft, operations are progressing rapidly. The rise of the water has been effectively checked, and the pumps are working well.

Virginia City, October 9.

TEXAS.

BREWSTER COUNTY.

(Special Correspondence).—The proved cinnabar district in the southern part of this county, adjacent to the Mexican border, has been enlarged by the recent discovery of rich cinnabar ore in the mountains about 30 miles north of Boquillas. The discovery was made by a Mexican goat herder who took samples of the ore to the town of Boquillas where it attracted the attention of miners. Thomas Locke and associates of San Antonio purchased the claim



Terlingua Quicksilver District.

and are preparing to develop the property. The scene of the new discovery is about 50 miles east of Terlingua, the chief quicksilver camp of that region.

Terlingua, October 9.

EL PASO COUNTY.

(Special Correspondence).—The El Paso Tin Mining & Smelting Company, which was recently organized with a capital stock of \$700,000, one-half of which is already paid in, has acquired a large tract of mineral land in the Franklin mountains, and is arranging to develop its holdings on a large scale. A large body of tin ore outcrops on the property, near Mundy springs, and the company will install machinery and sink a shaft to prospect the ground. It is claimed that several hundred thousand dollars worth of ore is in sight. It is planned by the company to erect a tin smelter when the property is sufficiently developed to justify that improvement. The discovery of tin ore in the Franklin mountains was made in 1899. According to the report of mining engineers who examined the property, the ore is cassiterite, associated with quartz veins in the granite at the eastern base of the range. The tin veins occur along joints in the granite and dip perpendicularly or at high angles with an east and west strike.

El Paso, October 11.

PRESIDIO COUNTY.

(Special Correspondence).—John T. Fredley will erect a stamp-mill at his silver mine in the Clenega mountains, about ten miles west of Shafter, where the famous Shafter silver mine is situated. A number of good claims have been located in that district recently and the prospects of considerable mineral development are considered promising.

Shafter, October 9.

UTAH.

JUAB COUNTY.

The lower levels of the Raymond-Illinois mine, at Eureka, are to be explored with diamond-drills. The company is now working on the 1500-ft. level and expects to drill 500 ft. below this.—The Uncle Sam Mining Co., of Tintic, declared a dividend of 2c. per share, amounting to \$10,000.

SALT LAKE COUNTY.

The annual report of the Utah-Apex Mining Co. gave the number of tons mined as 33,407, the cost per ton of mining being \$2.47. Milling costs were \$1.37, smelting of first-class, \$5.71, concentrate, \$3.63, and freight on the material shipped, 83c. per ton. The profit for the year amounted to \$124,185, and in the mine there is approximately 80,000 tons of ore blocked out.

SUMMIT COUNTY.

The company operating the Silver Bell mine, in Thaynes canyon, near Park City, has been re-organized, and operations will be resumed at the mine, after a shut-down of four years. Anton Pederson is president of the company.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The New Republic Co. has installed a motor on Granite creek, to pump water to the Republic mine. The pump has been replaced in the winze, below the 600-ft. level, and the hoisting engine at the head of the winze has been connected with the electric plant at the portal of the No. 3 adit. The winze has been unwatered to a depth of 90 ft., and mining operations will be resumed on the 700-ft. level as soon as the drainage is completed. On September 22 a carload of sacked ore was shipped to the Tacoma smelter, which averaged about \$200 per ton. At the same time a bulk carload was shipped, which ran from \$65 to \$70 per ton. The company is now shipping 200 tons per week. Since the Republic mine was leased to the company, the smelter returns filed with the Ferry county auditor show that ore has been shipped which assayed 35.85 oz. gold and 784.2 oz. silver per ton. This rich ore amounted to 244 lb. and was sent to the Trail smelter. One shipment of 199 tons to the Tacoma smelter contained 19.5 oz. gold and 51.3 oz. silver per ton. Freight and treatments at the Granby smelter amounted to \$6.75 per ton. The following monthly shipments since January 1, 1909, have been certified to the Ferry county auditor:

BY THE GRANBY SMELTER.

| Month. | Dry Wt. lb. | Total Gross Value. | Total Net Value. |
|---------------|-------------|--------------------|------------------|
| January | 102,996 | \$ 3,551.32 | \$ 3,119.86 |
| February | 240,242 | 3,030.81 | 2,209.12 |

BY THE TACOMA SMELTER.

| | | | |
|--------------|---------|-------------|-------------|
| February ... | 81,663 | \$ 8,424.31 | \$ 7,958.10 |
| March | 111,888 | 704.89 | 176.21 |
| April | 436,152 | 10,574.73 | 8,350.57 |
| May | 534,284 | 14,801.62 | 12,104.63 |
| June | 586,261 | 14,850.57 | 11,871.12 |
| July | 786,459 | 17,076.80 | 12,981.66 |
| August | 606,678 | 11,130.31 | 8,040.62 |

Total 3,489,623 \$84,145.36 \$66,811.89

The Jim Clark adit, at the Pearl Consolidated, has been driven 30 ft. on the No. 4 Lone Pine vein, which was 20 in. wide when first cut, and is 3 ft. wide at the breast. The ore across the vein runs about \$50 per ton, and samples have assayed as high as \$370 gold per ton.—The adit of the Hercules mine, at Park City, now in 331 ft., is to be extended 300 ft. to drive it under the cropping of the vein, at a depth of 250 ft. The cropping is rich silver-copper ore and about 10 ft. wide. A rich strike is reported from the Sunrise mine, at Danville, samples of ore from which are reported to assay from \$3000 to \$4000 per ton.—About 200 ft. from the portal of the adit at the Jennie mine, near Rockcut, a winze is down 25 ft. on three stringers of copper and galena ore.—The shaft of the Kettle River mine, at Rockcut, is down 143 ft., and the company has decided

upon the showing made, to install a concentrating plant. The mine is equipped with a steam hoist, air-compressor, and machine-drills.—The Summit Gold & Copper Mining Co. is advertising for bids to sink the upper shaft on the Railroad group 50 ft., and to sink the Summit winze 50 ft., with the privilege of 50 ft. additional at each place.

Republic, October 11.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The Velvet-Portland mine, west of Rossland, has been leased to Ed. Ehrenberg, of Spokane, by an English syndicate. It is equipped with a concentrator and compressor plant and is opened to a depth of over 400 ft., the ore assaying from \$20 to \$40 per ton gold, silver, and copper. The opening of this property seems to assure the resumption of work at the Le Roi smelter at Northport in the not distant future, which means that the Le Roi will then begin shipping.—At the meeting of the Consolidated Mining & Smelting Co., of Canada, Ltd., to be held in Toronto, October 12, the directors considered a proposition to increase the capital of the company from \$5,500,000 to \$7,500,000. As the company has adopted a big expansive policy, it has been found necessary to seriously consider this step.—Hugh Harris, and associates of Rossland, have bonded the group of claims owned by them at Nine-Mile mountain, near Hazelton, to W. L. Somerville, for two years for \$60,000. The property is a rich silver-lead group and it is planned to begin shipping next spring, by boat from Hazelton.—Mining operations are lively in the Sheep Creek district. A bond has been taken on the Searchlight group, which adjoins the Mother Lode and the Bayonne, which has been held at a high figure by its Butte owners, has been bonded to a New York operator who has also taken over the Clyde-Belt group and the Kennedy.

The West Kootenay Power & Light Co., of Rossland, will run a power line into the Sheep Creek mines and supply power to that district, the average charge being \$32 per hp. per annum.—At the Mother Lode mine, in the Nelson district, now being operated by John McMartin, an engineer is surveying sites for a new stamp-mill and surface plant. The recent find in the lower adit of this property is giving excellent results as work is continued.—At the Nugget mine a 4-ft. vein of good ore has been cut on the fourth level during the past week.—The head-frame at the Silver King mine, near Nelson, has been repaired and shipping will be resumed during the coming week.

The Alma M. mineral claim, 8 miles from Nelson, has been bonded by J. T. Hillis, of Vancouver, and S. S. Raymond, for \$45,000.

The Van-Roi Mining Co. will soon make the last payment on the Vancouver group near Silverton. This property was bonded several years ago by the Le Roi 2, Ltd., and turned over to the new company. Of the purchase price, which is \$150,000, most of the money has been derived from the product of the mine itself.—The lessees of the Ottawa shipped 34 tons of ore the past week.—A car of ore was shipped across Moyle lake from Aurora mine last week.

Ten thousand acres of coal land have recently been acquired in the Peace river district by eastern Canadian capitalists. The coal, which has been found in rich deposits, is said to be a good coking and domestic coal.—The Oro Denoro mine, of the British Columbia Copper Co., near Phoenix, shipped 300 tons last week. The Sally also shipped 22 tons of high-grade ore. Shipments from the Mother Lode amounted to 1000 tons last week. The Greenwood smelter, where No. 3 furnace has been blown in to treat the increased Mother Lode as well as the Oro Denoro shipments, received 8800 tons of ore.—It is now announced that the B. C. Copper Co. will not begin diamond-drill exploration this year on the recently bonded groups of claims in Kamloops. The change of plans has been caused by the recent agreement to work the mines and treat the ore of the New Dominion Copper Co.—The seventh enlarged furnace was blown in at the Granby smelter last week. The last one will be put in operation on October 10, when shipments from the mine will be slightly increased.—An English syndicate has bought 3520 acres of coal land on Granite creek for the sum of \$200,000 from the Tulameen Coal & Coke Co. The

property is 11 miles from Princeton and near the V. V. & E. railway.—An explosion of gas in the Extension mine, of the Wellington Colliery Co., killed 28 men. The explosion started a fire in the mine and it was with great difficulty that the bodies of the miners were recovered.

Rossland, October 9.

MEXICO.

CHIHUAHUA.

The Porvenir Mining Co., operating in the Parral district, has been re-organized under the name Corona Consolidated Mining & Milling Co. The stock of the company has been reduced and the management plans to erect a mill this winter. Nat P. Wilson is manager.—A large number of the stockholders of the Alvarado Consolidated Mines Co. visited the properties of the company in the Parral district the first of the month. The plans for the new mill were approved and contracts for machinery and supplies are being let. James I. Long is manager.—The Lustre Mining & Smelting Co., operating near Parral, is being re-organized and will soon be in a position to settle all financial obligations. R. W. Bissell is in charge of the property.—The Cordero Mines Co., operating the Soledad property at Cordero under lease, shipped a carload of ore last month that assayed 40% lead and 4 kg. silver per ton and expects to ship four carloads of similar ore this month. There are a number of old mines at Cordero, which is 35 miles from Parral, that have produced well in the past, and the prospects for the revival of interest in the mines of that district are excellent.

JALISCO.

The Tajo Mining Co., which recently erected a cyanide plant at its mines in the district of San Sebastian, sent the results of the first clean-up, consisting of 604 lb. of precipitate to the National Metal Co. in Mexico City. This produced about \$10,000. The plant has a capacity of 30 tons per day, and the extraction is said to be as high as 90%. Robert H. Lilly is in charge of operations.

OAXACA.

The 5-stamp mill of the Rio Seco Mining Co., at El Parian, will be in operation in about six weeks. The plant is experimental and a larger one will be erected later on.—The El Placer mine and mill, situated a few miles from Oaxaca, operated by the Boston & Oaxaca Mining Co., were sold at auction on September 29. According to information received from the local management, internal dissensions in the company have made this course necessary.—A stamp-mill has been installed at the El Socorro mine and another at the Old Mexico mines, in Sierra Juarez.—The San Juan mine, in the Taviche district, is being sampled by Denny Bros., who have an option on the property. The price is said to be \$500,000.

SONORA.

If the present plans of the Cole-Ryan interests are carried out their relation with Phelps, Dodge & Co. will be closer than ever. The Indiana-Sonora and other properties in that district will be turned over to the Cole-Ryan people through the Greene company. It is also probable that the Greene company will build a railroad to connect with the Phelps-Dodge line if a more favorable rate cannot be obtained from the Southern Pacific. If this road is built, it is likely that they will raise the necessary money by a new stock issue.—Three Tremain steam stamps have recently been installed by the Candelerio Mining Co. on its mine at La Barranca. The mill has now been in operation for a month, and the superintendent, S. Ben Smith, reports a capacity of 16 tons per twin unit, crushed through 30-mesh in 24 hours.

SALVADOR.

Gonzales & Vides are building a mill and cyanide plant on their property on El Mineral Comacarán. The foundations and buildings are being erected and although the machinery has been shipped from Chicago, its transportation from La Unión to the mine cannot be undertaken until after the rainy season. The plant, though small, is complete in every detail, and includes a Blake crusher, Allis-Chalmers stamps, vacuum filter, tube-mill, and air-agitator, while all tanks are built of steel plate.

Special Correspondence.

SALT LAKE, UTAH.

American Institute Visit. — September Copper Production. — International Ore Supply. — Boston Con. Ore Contract. — Lewisohn Interests.

The feature of the week here has been the visit of the American Institute of Mining Engineers. The party, after a pleasant day at Tacoma, and a disappointing one at Portland, arrived Wednesday. Three days were spent inspecting local mines, mills, and smelting plants. The visitors were met on arrival, October 7, by a committee of local members including R. H. Bradford, Ellsworth Daggett, Robert Forrester, Samuel Newhouse, D. C. Jackling, L. Hanchett, J. C. Dick, R. C. Gemmell, L. S. Cates, E. P. Jennings, C. W. Saxman, B. F. Tibby, J. B. Risque, Thomas

stamp-mill is doing the work and the separation accomplished on the Wilfley tables and Johnson vanners is up to expectations. The Boston Consolidated was especially frank in giving information and inviting criticism and distributed a pamphlet giving in great detail the costs for the month of September. On Saturday the visitors were the guests of the Utah Society of Engineers for a trolley-car ride about the city in the morning, and in the afternoon made an excursion to Saltair; Saturday night the visitors left for Colorado.

Utah mines produced, approximately, 10,500,000 lb. of copper during September. The Bingham production increased considerably. Utah Copper made a new high record, producing over half the total. The Coppertown plant has been brought up to a capacity of 1000 tons per day, while the Garfield mill is handling something in excess of 6000 tons. D. C. Jackling, general manager, has recommended the addition of 3000 tons to the present plant, and if conditions in the metal market are favorable, this work may be started by April of next year.



Map of Utah.



Bingham Canyon.

Weir, C. E. Allen, G. W. Metcalf, S. R. Woodbridge, C. W. Whitley, George W. Heintz, P. E. Barbour, George D. Blood, E. W. Durfee, George W. Riter, John Dern, A. J. Bettles.

The special train was taken at once to Bingham Canyon, the town which has been described as two miles long, fifty feet wide, and eighteen inches deep—the last referring to the mud in the single street. However, the engineering features of the canyon soon attracted attention away from the town itself. The only mine inspected in detail was the great open-cut working of the Utah Copper Co., which was examined with much interest. After luncheon on the train, when the members of the local committee were the guests of the visitors, stops were made at the smelters at Bingham and Murray. In the evening, after the return to Salt Lake, the visitors were entertained by an organ recital in the Mormon Tabernacle. Friday was devoted to visiting the smelter of the American Smelters Securities Co., the concentrating mills of the Boston Consolidated Co., and the Utah Copper Co., all at Garfield, and the mill and smelter, under construction, of the International company at Tooele. At the mills of the Boston Consolidated and the Utah Copper Co., an excellent opportunity was afforded to study two different methods of treatment of the same character of ore. The Boston Consolidated mill is equipped with Nissen stamps, and the Utah plant is equipped with Chilean mills. At the time the Utah mill was constructed it was not believed that the ores could be successfully treated by stamps, but the

Work at the International smelting plant, near Pine canyon, is being rushed, and E. P. Mathewson, general manager, says that less delay in the delivery of material has occurred than was anticipated. Both day and night forces are being employed, and some of the steel structures are now completed. Brick work is going forward. The foundation of the great stack, which is to be 350 ft. high, is in, and 10 ft. of the base of the stack is up. Originally the plant was designed for treating 2000 tons of ore per day. Since the Cole-Ryan interests have failed to obtain contracts for the treatment of the Tintic ores, plans have been changed. The plant will only be built to treat 1000 to 1200 tons of the Utah Consolidated output for the present. The company will be in the market for other ores and as fast as conditions justify, the capacity will be increased. Ohio Copper and other producers that have not entered into long contracts with the American and United States companies, are expected to close contracts with the International. It is also understood that the Boston Consolidated is not satisfied with its existing contract with the Garfield plant, and has been dickering with the Cole-Ryan people. The split between the Boston Consolidated and the Garfield company dates back several years. When the Utah Copper, Boston Consolidated, and American Smelters Securities companies entered into an agreement to take up a large tract of land along the shores of Great Salt Lake, they were to have a community interest in the ground which constituted the

site for the smelter, two mills, and a town for the employees. After the transfer of the property had been made to a joint company and water rights secured, Samuel Newhouse became dissatisfied with the contract made for the smelting of the Boston ores. After numerous conferences with the Guggenheims in New York, a modified contract was substituted. Everything went well for a time, but since the International has entered the field it is apparent that the Boston people are after a further reduction in treatment charges. The Boston is producing in the neighborhood of 2,000,000 lb. of copper per month, and should this ore be withdrawn from the Garfield plant at the same time the Utah Consolidated diverts its ores to the International, it would seriously cripple the Garfield furnaces. These are now treating upward of 3500 tons of copper ore daily.

The first section of the Ohio Copper mill will be in operation within 60 days, provided no unforeseen interruptions occur. Colin McIntosh, general manager, is confident that the entire mill will be running within six months. He expects a high saving and to be able to produce at less than 8c. per lb. The rumors connecting the name of the Cole-Ryan syndicate with control of Ohio Copper have ceased. Recently a prominent engineer of the Lewisohn staff has been here and it is said that the object of his trip was to inspect Ohio Copper properties. The Salt Lake copper ground owned by the Lewisohns has caved badly, and they have discontinued operations. The output for the past month is only half the normal production, and they now intend to turn the property over to lessees. The management will not say what action the owners are going to take regarding future operations, as it has not finally been decided what course to pursue. These conditions have resulted in a rumor that the Lewisohns intend to get another copper producer in Utah. F. Augustus Heinze states that the control of Ohio Copper has passed from his hands. The fact that the new owners have been unable to finance the proposition leads to the belief that the property is still in the market.

NEW YORK.

Cumberland-Ely Again.—Copper Corporation Forming. — Toulumne Copper Advances.—Batopilas Financed.—Camp Morado.

Last week mention was made of the probable consolidation of Cumberland-Ely and Nevada Consolidated. Cumberland-Ely has continued to be something of a market factor during the week, but some are inclined to credit the buying rather to the Cole-Ryan interests than to the Guggenheims. It is now stated that during the recent liquidation of the Thompson holdings in Cumberland-Ely no small part of the stock was taken by Mr. Cole and his associates. In fact, this move is said to be part of a big program for a copper combine, to be modeled closely after the lines of the United States Steel Corporation. Several considerations would tend to make a controlling interest in Cumberland-Ely peculiarly valuable to the Cole-Ryan people. They have recently acquired the Giroux, and several surrounding properties. The Giroux must have a smelter and transportation facilities. Cumberland-Ely has a three-eighths interest in the Steptoe smelter and a half interest in the Nevada Northern railway. A welding of these interests with the Giroux would give the owners a commanding place in the Ely camp. While no definite admissions can be obtained as to the deal between the Cole-Ryan interests and Phelps, Dodge & Co., it is undoubtedly true that negotiations are under way whereby the former are to get some of the minor properties of the latter, including the Moctezuma and probably the Detroit. These are to become part of a consolidation of Mexican properties with the Greene-Cananea at the head for the present. The Hovland & Smith properties, at Globe, lying adjacent to the Miami, also have passed to the Cole-Ryan interests. In view of these purchases it is not surprising that rumors are heard of a company to hold some such place in copper as the Steel Corporation holds in its domain. Although the Amalgamated Copper Co., as a corporation, has made no move outside of Butte so far, yet its weight doubtless will be thrown into such a consolidation the moment plans are sufficiently matured.

Marketwise, the feature of the Street for the week was the rise in Toulumne Copper. The stock has moved up from \$2.50 to \$4.50 and it is noted as the most important market advance in the Street for several months for the reason that there has been an absolute freedom from manipulation. The market has been very strong and it would appear that further advances are to be expected. Ely Central has absorbed a large share of the attention of the traders. A report made on the company's ground at Ely, is favorable, and a strong advertising campaign has carried the stock to a level of \$1.50.

A contract has been made between the Batopilas Mining Co. and the Batopilas Mining, Smelting & Refining Co., Ltd. of London. The latter company has a capital stock of £300,000, divided into 3000 shares of a par value of £1. Of the stock of the English company 250,000 shares is to be placed in the American company's treasury permanently, 50,000 shares is to be sold at \$7.50 per share, and the balance of 25,000 is to be held in reserve in the treasury of the English company. The mines, mills, and haciendas are to be turned over to the English corporation under a lease running 25 years. The mines include at present the Todos Santos, Cinco de Mayo, the Ballinas, and the San Miguel, on all of which a vigorous campaign of development and extraction is planned. The contract provides that the English company shall pay, both principal and interest, the entire bonded indebtedness of the Batopilas Mining Co. The option on the Campo Morado in the State of Guerrero, Mexico, has been allowed to lapse. The option, as it stood, ran to John B. Farish and the price named for the property was \$10,000,000. Another option has been given to the Exploration Co., Ltd., of London, and Philip Foster is now busy examining the mine. In order to secure the option the Exploration company was required to pay over by way of advance or loan, to José M. Ortiz the sum of £25,000 to be used in erecting a concentrating mill. It is stated that this sum has already been paid to the Mexican owners of the property. It is claimed that the Campo Morado is the greatest mine in Mexico today in point of developed tonnage. The real problem to be solved is transportation. The mine lies in the heart of the Sierras; it must have a railroad to do it any kind of justice. While a road can be constructed up the valley of the Balsas river, the work will be both arduous and costly. The Pinguico Mines Co. reports for the five months ending September 1 as follows: Ore milled, 32,664 tons; product-bullion, \$331,485; concentrate, \$117,268; total gross value, \$440,453; net profit, after deducting all expenses, \$195,073. Average monthly net profit for five months, \$39,014. Monthly dividend requirements, \$10,000. The floating debt, which on April 30, 1909, amounted to \$127,100, has been paid.

MEXICO.

Zinc Smelter for Mexico. — Patent Law. — Necaxa Dam. — Panama Canal.—Pump-Sluicing Plant.

The zinc problem in northern Mexico, caused by the United States tariff on zinc ores, seems likely to be solved by establishing a zinc smelter at Sabinas, Coahuila, 72 miles south of Eagle Pass. It is expected that by January active work will be begun on the erection of a plant. The scheme is being backed by J. T. Willet, with the support of Kansas City capital. There are coal mines in the neighborhood, a water-supply can be obtained, and it is favorably situated with regard to transportation. The smelter can be shipped to Europe in bond on through bills of lading by way of New Orleans and Galveston. Mr. Willet states that he has secured a large tract of land near the International railroad lines, and a private track will be laid to connect with the railroad. The State Government has granted a liberal concession, and it, therefore, seems certain that the new enterprise will soon be in working order.

The regular meeting of the Instituto Mexicano de Minas y Metalurgia took place September 30. A semi-official paper was read by Leopoldo Salazar on cyanide patents in Mexico. The object of this paper was to foment a discussion among engineers and other interested parties, on the basic principles of the patent law. We learn from high authority that

there is a serious movement on foot in Government circles to reform the existing patent laws, and the authorities are desirous of a free discussion of the subject.

It must certainly be disappointing to a large mining company, to fail to receive the supply of electric power they had counted on, and a penalty for non-delivery of power by a specified date is especially just when a large milling plant has been installed in anticipation. We refer to the contract between the Amparo Mining Co., of Jalisco, and the Chapala Hydro-Electric & Irrigation Co., for the delivery of 700 hp. by July 1 of this year. Failure to make delivery called for a penalty of \$100 per day which is not excessive considering that the mining company is now spending approximately \$100,000 per year for 350 hp. With electricity on a basis of \$100 per electric horse-power per year the cost will be only \$70,000 yearly for the 700-hp. plant that has been installed. The power is now promised for the beginning of the year, and the accumulated penalty will go to the credit of next year's power-bill. The Amparo company is now crushing about 5000 tons per month with a 50-stamp mill, and it is the intention of the management to add 10 stamps next year. The funds for the fourth quarterly dividend, payable on November 10, are now in Philadelphia awaiting distribution.

Colonel Goethals, chief engineer of the Panama canal, visited Mexico City, principally to inspect the work of the Mexican Light & Power Co., at Necaxa, where the construction of a great hydraulic-fill dam with a concrete core, has been in progress. The failure of part of the earth-fill, in the form of a slide last winter attracted the attention of the engineers at Panama, in view of the fact that the great Gatun dam is being constructed much on the same lines. It was the desire of Colonel Goethals to make a personal inspection of the work at Necaxa, and find out, if possible, the cause of the break. He made a tour of inspection in company with E. D. Trowbridge, the general manager for the Mexican Light & Power Co., and was shown over the works by Mr. Caldwell, assistant chief engineer. Colonel Goethals was greatly surprised at the extent of the undertaking. He expressed the opinion that the failure was due to the nature of the material used, and to lack of knowledge of those actually in charge of the work of the exact performance of this material while being packed in a large hydraulic fill. He further stated that the manner in which the work was now being done, made it absolutely certain of success, and that the Necaxa dam would, in some respects, be superior to the Gatun, as the former would have a concrete core which would be impossible in the case of the latter. The Necaxa dam, when completed, will have a head of 150 ft., while the Gatun dam will have only 85 ft.; the length of the Gatun dam will be greater, and the base will also be wider as Congress and the engineers insisted on building the dam so thick that even a layman could see and believe in its security. The Gatun dam is being built of river deposit, that is, gravel, with a large percentage of sand. In discussing Panama affairs with Colonel Goethals he remarked that the contract for the machinery for the large hydraulic-pump sluicing plant for the Corazal division had been let to the Worthington Pump Co., of New York. This plant will be of particular interest to placer miners throughout the world, as it will be the biggest example in the way of handling dirt by hydraulic methods yet attempted, and the data obtained from the excellent records that are always kept in the canal work, will be of value in the design of similar enterprises in future. A prism of the canal immediately south of the Miraflores lock-site is to be excavated by means of hydraulic giants, and the dirt, as washed, sluiced into sumps, from which point it is to be elevated by dredge-type centrifugal pumps, and distributed over the swamp-lands on either side, filling and reclaiming them. The volume of dirt to be handled is approximately 8,000,000 cu. yd., and the plant will consist of 5 units, each capable of handling 300 cu. yd. per hour. As there is no natural head of water obtainable, pressure-water, under a head of 130 lb. per sq. in., will be developed by pumping salt-water. The total capacity of the pumps will be 30,000 gal. per min. Besides the pressure-pumps, dredge-pumps, and giants, there will be required about 10,000 ft. of main and branch-pipes. The

total capacity of the plant will be between 30 000 and 40,000 cu. yd. per day of 24 hr. The power for driving the pumps will be obtained partly from the existing electric power-distribution system, and partly from a special steam-plant which is included in the contract. The plant will be installed and running inside of six months.

LONDON.

Oroville Dredging. — New Equipment. — Reaching into Colombia. —
Globe & Phoenix, Rhodesia.

The first meeting of shareholders of the new English company formed to take over Oroville Dredging was held this week. It will be remembered that the American company of that name was formed in 1905 to take over and consolidate the properties of the Boston & California, the Oroville Mining, the Oroville Gold Dredging & Exploration, and the Bear River companies. The shares proved so popular in England that the majority are now held here, but on the other hand it must be confessed that recently the secretiveness of the American directorate and management caused the shares to lose caste. In order to bring the direction of affairs more into the hands of the majority of shareholders it was decided to transfer the property to an English company. This was accordingly done in June last, and the London Venture Corporation is now supervising the direction of affairs. It is interesting to mention also that the Consolidated Gold Fields of South Africa own a substantial block of shares, and have a representative on the board. As an example of the irritating methods of the late American board, I may mention that the report for the operations during the year ended July 31, 1908, has only just been published. This habitual delay has led to all sorts of unfounded surmises detrimental to the management and the property. It is a pity that the advantages of having an excellent property and a first-class manager should be neutralized by a policy of secrecy and delay which is usually the characteristic of unsound companies. It is announced that the directors are considering the advisability of scrapping the present plant and substituting new dredges having a bucket-capacity of 13 cu. ft., similar to those working at the Yuba Consolidated. It is only 18 months since some of the nine dredges now at work were remodeled with 7-ft. buckets, but the great saving in costs promised by the larger size would pay for the new plant in less than two years. It is estimated that the life of the various properties is 14 years, so that the saving effected by improved plant will make a vast difference to the eventual profits. The English company has recently concluded arrangements for the acquisition of 22,000 acres of gold-bearing gravels on the Nichi river, six miles above Zaragoza, in Colombia. So far 310 acres have been thoroughly prospected by drilling, and 13,000,000 cu. yd., averaging 31c., have been proved. The property is held by a West Virginia corporation, the Pato Mines Co., of the stock of which the Oroville Dredging Co. acquires 75% in return for the provision of working capital. To provide this money, Oroville Dredging is creating £62,500 debentures.

During the last few months rumors have been afloat regarding a new discovery at the Globe and Phoenix mines in Rhodesia. These mines, or at least the Phoenix, have been prosperous in the past, but recently a dike threatened to cut out the ore. During July and August, the shares began to go up, clearly showing that somebody knew of a turn for the better, but to all kinds of appeal the directors returned no answer and vouchsafed no information. Then, on September 3, a small paragraph was issued in the press announcing the driving of 140 ft. through high-value ground. As a matter of fact this explanation was far from telling the whole story, as may be judged by the half-yearly report of the directors, and the interim report of H. A. Piper, the consulting engineer, which have been issued this week. The Globe & Phoenix company was formed in 1895 to acquire the Globe and Phoenix mines, 140 miles north of Bulawayo, Rhodesia. Milling commenced in 1900 with 40 stamps; a cyanide plant started work in 1901, and a slime-plant in 1907. The Globe mine is closed, and for several years the Phoenix has been the mainstay of the company. From the

commencement up to the end of 1908 dividends, amounting in all of £1 14s. 6d. per £1 share, on a capital of £200,000, have been paid, which means a return of 172½% on the nominal capital of the company, but it must not be forgotten that in 1895, 50,000 of the shares were issued at £2, and in 1899, and again in 1902, new issues were made at £4 each, facts which make a considerable difference when estimating the return on investors' money. The report of the directors now issued is dated September 15, and that of Mr. Piper, September 9. The important information contained in these reports is the announcement of the finding of the vein in place below the intrusive dike. Furthermore, the veins have widened, and the newly developed parts are of much higher metal-content. At various parts substantial bodies of ore, averaging 44 and 52 dwt., have been developed, and the estimated reserves on June 30 are given as 168,984 tons, containing 22 dwt., an average which is 6 dwt. higher than the reserves contained six months ago. During the first six months of the year the 40-stamp mill crushed 35,051 tons and extracted 24,986 fine ounces, or 13.22 dwt. per ton. The mill-feed assayed 20.63 dwt., and the tailing 6.04 dwt. The cyanide plant treated 20,364 tons of sand, having an assay value of 5.91 dwt. The extraction was 1928 oz., or 2.15 dwt., leaving 3.76 dwt. in the residue. The slime-plant treated 11,783 tons of accumulated slime, assaying 2.5 dwt., leaving 0.45 dwt. in the residue; and 2780 tons of current slime, assaying 5.82 dwt., and leaving 3.82 dwt. in the residue.

BUTTE, MONTANA.

Butte-Milwaukee.—Zinc-Concentrator.—Butte-Ballaklava.—Smoke Suit.—Ohio-Keating.

There is good prospect for an early resumption of work by the Butte-Milwaukee Mining Co. on the Colonel Sellers group of claims in the North Butte portion of the district. Contracts are being made in New York for work to be started within a few weeks. The big strike in the Tuolumne mine and the boom in Butte & Superior have attracted attention. The Colonel Sellers claims adjoin those of the Butte & Superior. A three-compartment shaft has been sunk more than 700 ft., and it is proposed to carry the shaft to a depth of 1500 ft. before the veins are opened by cross-cut. The Butte & New York company is a holding corporation for the Butte-Milwaukee. The announcement is made that the American Metal Co. will build a zinc concentrator for the Butte & Superior and also take a large financial interest in the company. There remain \$280,000 of an authorized issue of \$500,000 of bonds yet in the treasury. The Butte & Superior owns half a dozen old producing silver mines in the North Butte section of the district, and the Blackrock group has been developed for copper deposits, but in doing so an immense tonnage of high-grade zinc ore has been blocked on the levels above the 1200-ft. W. A. Clark, who has a big zinc mine in the Elm Orlu, was the first to ship ore for its zinc, but the Butte & Superior and American Metal Co. will go into the industry on a large scale. The concentrator will have a preliminary capacity of 500 tons per diem, and will be erected at a cost of \$150,000. The Blackrock mine can furnish that quantity of zinc ore without much effort. It is said that a zinc smelter will eventually be built in Butte. Especially rich in high-grade zinc ore are the mines of the Butte & Superior, Lexington, Alice, and Moulton companies. The old Emma mine, owned by the Butte Copper & Zinc Co., also has an immense tonnage in sight. The Butte-Ballaklava company is pushing development on five levels in its mine, and has just cut into the second large orebody on the 1400-ft. level. On the 1200 the orebody has widened to 7 ft., all first-class ore, much of it glance and bornite. The company has placed a contract for a new steel head-frame, 98 ft. high, to be in place in about 90 days.

The farmers of the Deer Lodge valley have not yet abandoned their fight on the Amalgamated smelter at Anaconda, and have given notice of appeal to the United States Circuit Court of Appeals, accompanied by a long assignment of errors. The farmers assign as one error the refusal of Judge Hunt to order an arbitration after the farmers had

expressed a desire to arbitrate. Another charge made in the assignment is that the agents of the Amalgamated made threats to keep up the fight in the courts until the farmers didn't have money enough left to buy breakfast.

The Ohio-Keating Gold Mining Co. has just installed one of the most complete gasoline plants in the West, and the property is in such good shape that regular and permanent shipments of ore can be counted on by the first of November. One shipment was made a few days ago. The veins are showing up better every day. The drift on the 120-ft. level is all in ore, averaging 2 ft. wide, and giving an average of \$50 per ton. Shaft sinking has also been resumed.

KALGOORLIE, WESTERN AUSTRALIA.

Output.—Chaffers Resumes.—Associated Northern Unwatered.—Lancefield.—Labor Agreements.—Water Rates.

The gold output in this State for July was valued at \$2,825,000, while dividends totaled \$470,000. So far this year we are \$580,000 in gold and \$560,000 in dividends behind last year. The yield may be expected to still further decrease despite the Chaffers, a new producer, which lately crushed 4120 tons yielding \$39,000 gross and a profit of \$5500. This mine is on the south end of the Golden Mile, along with the Main Reef, the Hannans Star, and Deep Levels; the two latter having been consolidated. The new work in the Chaffers is due to tributors finding a new lode. Now the company is working this and crushing both oxidized and sulphide ores at the Main Reef mill. The oxidized ore is a soft lode material and is crushed wet in a Humboldt ball-mill at the rate of some 85 tons per day. The sulphide ore is crushed dry in two No. 5 Krupp mills, roasted in three Edwards furnaces, mixed with weak KCN and the pulp from the wet mill, ground in four 5-ft. pans, agitated in ordinary tanks, and filter-pressed. This treatment gives satisfactory results. It will not be many months before the Golden Link Co., at the north end of the 'Mile', will start erecting a plant, presumably for dry-crushing and roasting. About 80,000 tons of \$10 ore is now opened up.

The Kalgoorlie Amalgamated Leases are being vigorously prospected after years of idleness, save some work by tributors; and some really promising ore is being found. It may be mentioned that telluride was first discovered at Kalgoorlie in this mine. The North Kalgurli Co. has just duplicated its 10-stamp mill and cyanide plant, but it may be difficult to keep 20 stamps at work. The Associated Northern has unwatered its mine from levels 7 to 12, and is about to do some prospecting at 1050 ft. The general opinion about the famous Brownhill-Iron Duke-Oroya shoot is that there is nothing under it or east of it. The Associated company announces its ore reserves as 483,517 tons worth \$9.50 per ton. The average ore in this mine runs some 6% sulphur, and roasting is much slower than at other mines. In development the Perseverance is spending over \$20,000 monthly, and has opened up a deal of average grade ore. In the Ivanhoe, the East cross-cut, in section 7 at 1970 ft., is in 47 ft. of ore worth \$11.50 per ton.

Three feet of mineralized schist worth \$2 was found, by diamond-drilling from the 2500-ft. station, in the Edwards shaft of the Great Boulder, 48 ft. west from shaft. At 98 ft. west, 14 ft. of quartz worth \$10.50 was also found. After years of experimenting, many breakdowns, and changes of management, it would appear as if the Lancefield mine, some 210 miles northeast of Kalgoorlie, was about to make profits. The ore is difficult to treat, but the trouble is gradually being overcome. Extraction is now about 81%. The wages agreement between the Chamber of Mines and the Labor Unions terminates next month, and several weeks ago a conference was held between the interested parties. The Union wanted a few concessions, but the Chamber did not agree, although quite agreeable to renewing the existing arrangements for another three years. The Unions required a few weeks' time for consideration, and next week will take a ballot on the question.

From time to time the Water Scheme has been mentioned in these notes. The Scheme pays all working expenses and interest on main and supplementary capitals, and something for renewal of pipes. The sinking fund of \$450,000 per an-

num is not met from revenue from water but is a direct charge on the whole State. The Government has been allowing the Mines Water Trust—the mines on the Golden Mile—water at \$1.25 per 1000 gallons for general purposes, but reckons that it costs \$2.16 per 1000 to deliver to it, that is, including every charge, so now they propose charging \$1.75 per 1000 to the Trust to try and get in something for the sinking fund. This, it is estimated, will cost the mines some \$200,000 extra per annum or about 10c. per ton. The matter is still under discussion. The corrosion of the main pipes continues, and much experimenting is being carried on to discover means of protecting them.

The July returns from the principal mines were as follows:

| Name. | Tonnage. | Yield. | Profit. |
|--------------------------------|----------|-----------|-----------|
| Associated | 11,645 | \$105,000 | \$ 30,000 |
| Associated Northern Blocks.... | 3,760 | 30,000 | 10,000 |
| Golden Horseshoe | 25,107 | 255,000 | 100,000 |
| Golden Ridge | 2,280 | 28,000 | 14,000 |
| Great Boulder Proprietary | 18,327 | 250,000 | 130,000 |
| Great Boulder Perseverance ... | 19,466 | 145,000 | 22,000 |
| Great Fingall | 10,755 | 73,000 | 6,000 |
| Hainault | 5,807 | 38,000 | 6,000 |
| Ivanhoe | 19,427 | 205,000 | 100,000 |
| Kalgurli | 10,710 | 140,000 | 80,000 |
| Kalgurli South | 9,038 | 62,000 | 13,000 |
| Lake View Consols..... | 11,011 | 65,000 | 13,000 |
| Lancefield | 6,777 | 54,000 | 4,500 |
| Oroya-Brownhill | 11,880 | 100,000 | 33,000 |
| Oroya-Black Range | 4,493 | 56,000 | 20,000 |
| Sons of Gwalla | 13,379 | 110,000 | 39,000 |
| Sons of Gwalla South | 2,013 | 21,000 | 5,500 |

DENVER, COLORADO.

Dredging at Breckenridge.—Development at Leadville. — The Doyle-Burns Case.—Cripple Creek News.—Coal Production.—Ouray Items.—Legal Decisions.

Mining throughout the State is active and prosperous. The weather has not, as yet, interfered with work. The Breckenridge dredging industry has been especially favored in this respect, and the operators hope to continue without interruption until December 1. The four dredges in the district are averaging \$100,000 total product per month. The value of the Swan river gravel, ranges from 20 to 25c. per cu. yd., and that in French gulch from 30 to 50. The gold production of Summit county for 1909 is estimated at about \$900,000, of which only about \$100,000 will come from the lode mines. Leadville mines have been unusually active throughout the season. Much prospecting and development has been done north and east of the city. The East Lake Mining & Milling Co., operating in the Holy Cross district, has uncovered a large vein of fair grade gold ore in the breast of its 2200-ft. adit, and is developing from the adit level. The old plant of the Harrison Reduction Co. has been purchased by the Cloud City Milling Co.

The famous Doyle-Burns law suit which has occupied the courts of Colorado and Iowa for the last 17 years, has been settled out of court. The only item of the settlement made public is that each party has to bear half the costs. It will be remembered that Doyle and Burns were partners in the famous Portland mine, of Cripple Creek, and the case was brought by Doyle against Burns to get half of the stock and dividends of Burns in the Portland company. Mining men all over the West who have been watching the progress of the Cripple Creek Deep Drainage tunnel, will be glad to learn that its completion is now assured. The \$160,000 lacking for the work has been secured. During September the tunnel was advanced 355 ft., making the total distance from the portal 11,022 ft. The breast is now under Regua gulch, between Beacon hill and Grouse mountain. The production for September from the district was \$1,297,440. This brings the total production for the nine months of 1909 up to \$11,911,245. Construction work on the new Portland mill is progressing rapidly, and an addition to the Independence has just been started.

Few people realize the extent of the coal industry in

Colorado. Coal is mined in 15 counties, of which Las Animas is the heaviest producer. The report for the first six months of 1909 shows a production of 4,823,412 tons, which is an increase over the same period in 1908 of 406,936. The coal production is a good index of the condition of the other industries in the State, and with winter at hand and business increasing, operators are predicting a ten million ton production for the year.

Ouray has the proud distinction of having the most productive gold mine in the world. The quarterly report of the Camp Bird, Ltd., gives the net profit derived from the mine during the months of May, June, and July, as \$761,806. At the present rate of operation the profits for 1909 should exceed the three million mark. The Mono-Baltic Mining & Smelting Co. has let the contract for the concrete work on its new smelter at Ironton. Supplies and machinery for the smelter are being delivered.

Now that the question of taxing idle mining properties has been brought to the public attention, the recent decision of Judge Sheafor, regarding the case brought by some of the idle mining properties in the Cripple Creek district against the officials of Teller county, has more than passing interest. The case was brought by the plaintiffs to secure relief from exorbitant taxation. They argued that they should not be taxed a higher rate than the lowest rate per acre on producing properties. The decision favored the plaintiffs, and now Teller county will have to return over \$10,000 to the various companies which paid their 1908 taxes under protest. The other decision of interest to mining men is that of District Judge Allen. The case was brought by Jacob and Henrietta Schloss, of Leadville, to force the Western Mining Co. to put down a shaft on the Neusitz placer according to its contract. The company had already drilled an 800-ft. hole on the property without discovering mineral, and Judge Allen ruled that a lessee of a mining claim is relieved of fulfilling the terms of the lease when to do so would be unremunerative.

TORONTO, CANADA.

Cobalt Dividends and Development.—Coal Strike.—Sault Ste Marie Iron Furnaces.—Yukon Gold Production.

The payment of large and in some cases increased dividends by the leading Cobalt companies for the third quarter of the year has had a marked influence on the market,



Cobalt, Ontario.

sending up the prices of most of the dividend-paying issues, while other stocks continue at a low level. In all seven companies have declared dividends for the current quarter calling for total payments amounting to \$1,328,531. Nipissing pays 5% dividend and 2½% bonus; Crown Reserve, 6% dividend and 5% bonus; Kerr Lake, 6%; Buffalo, 8%; Right of Way, 6%; and the Temiskaming & Hudson Bay, with its diminutive capital, the customary 300%. La Rose disappointed expectations by failing to increase its returns beyond the 3% dividend plus 1% bonus which it has been yielding for some time, and its stock is sagging accordingly. The total amount paid in dividends and bonuses by these seven companies since their organization is \$10,242,247. The Cobalt Central passed its dividend in order to enlarge its concentrator at a cost of \$30,000. There are now some 71 companies in actual operation at Cobalt with between 3500 and 4000 men on the payrolls. A factor

which will very shortly add to the productiveness of the camp is the development of electric power by several companies operating on the Montreal river, which possibly before the end of the season and certainly next year will be able to supply power for mining operations. Of these enterprises the most important is the Cobalt Hydraulic Power Co., at Ragged Chutes, where for six months 400 men have been engaged in driving underground workings.

The most important discovery made recently is the finding of rich ore on the Red Jacket property, which lies about two miles south of the town of Cobalt, indicating an important extension of the silver-producing area. This property belongs to a company capitalized at \$1,250,000, of which Burr E. Cartwright is president, is equipped with a good plant including a 100-hp. boiler and 6-drill compressor, and has spent about \$35,000 in equipment and development work. The main shaft was sunk on a vein of calcite showing smaltite in places, but no encouraging results were obtained, until about two weeks ago when, at the 125-ft. level, rich ore was shot through with native silver was taken out. The width of the vein at this depth is 35 in. A great deal of trenching has been done in the neighborhood, but this is the first native silver so far obtained. The Crown Reserve has secured a controlling interest in the Silver Leaf, the property of which adjoins its holdings, and is strongly represented on the newly elected directorate of the Leaf. John Carson is president of both companies. A good find, consisting of a vein 8 to 12 in. wide, has been made on the 75-ft. level. The 10-stamp mill of the Colonial mine is now completed and operation will be resumed as soon as air can be obtained from the power companies. Surface work on the Nipissing has resulted in the discovery of additional veins. There are now 131 valuable veins, the latest carrying an inch or two of plate silver. Gangs are at work stripping veins 129, 130, and 131, which show surface decomposition. They have taken 40 bags of ore from the muck, which will run 5000 oz. silver per ton. The fresh discoveries are in the Keewatin formation. A general belief obtains in mining circles that the Crown Reserve company has in contemplation a scheme for the drainage of Kerr Lake. The company has a rich ore reserve, but if much stoping were undertaken it would incur the risk of flooding from above. Sooner or later the drainage of the lake will be necessary if the immense resources below its bed are to be realized. The equipment of the Silver Cross mine has been greatly improved during the last few weeks and No. 2 shaft is now being put down to the 200-ft. level. It is being sunk on a calcite-smaltite vein, the silver content of which is increasing with depth. At the Temiskaming & Hudson Bay a winze is being sunk for 50 ft. from the 200-ft. level at the intersection of two good veins from which driving will be undertaken. A new main shaft will be put down at this point later on. The Prospectors Exploration & Development Co. has staked 10 claims in a new district on the lower branch of the Meteor river about 16 miles southeast of Gowganda. There has been a rush to this neighborhood lately and hundreds of claims have been recorded. The shipments from Cobalt last week amounted to 516 tons, the Cobalt Lake, Nancy Helen, and Silver Cliff, all which have been infrequent shippers, re-appearing on the list.

News of the Dominion Coal Co. strike at Glace Bay, Nova Scotia, is very contradictory, the only thing that appears certain in spite of frequent assertions to the contrary, being that the strike is still on and considerably limiting the output of the collieries. The Dominion Iron & Steel Co. is yet drawing a large proportion of its fuel supply from the United States. The announcement that the troops are to remain all winter does not augur well for a speedy settlement. Eugene Haanel, of the Department of Mines, recently announced that the Lake Superior Corporation of Sault Ste. Marie were making arrangements to adopt the electric smelting process for the treatment of iron ore, and preparing to install several electric furnaces of the type in successful operation in Sweden. The annual report of the directors of the Corporation just issued in advance of the annual meeting to be held next week makes no mention of any such intended departure—a rather singular omission unless Mr. Haanel's announcement was premature. The re-

port states that an additional blast-furnace with a rated capacity of 400 tons per day, will be constructed which will obviate the necessity of their buying pig-iron, and that the new merchant steel mill will enable them to manufacture structural steel in addition to rails, and insure the steady operation of the steel plant. The by-product coke oven provided for will supply the latter with all the coke needed. The financial statement shows a surplus of \$1,093,372 for the financial year, of which \$501,424 was contributed by subsidiary companies. The profit and loss balance is placed at \$522,178. The output of pig-iron was 130,268 tons, of bessemer rails 126,733 tons, and open-hearth rails 31,732 tons. While the pig-iron output was somewhat less than that of the previous year, the production of rails showed an increase.

The annual report of Alexander Henderson, Commissioner of the Yukon, gives the total gold production of the territory for the fiscal year, which ended March 31, as 217,350 oz. of the value of \$3,260,263, being an increase of \$440,000 over the preceding year. The Government received royalties on gold amounting to \$81,507. Mr. Henderson speaks in a highly optimistic strain as to the future of the territory, predicting great things from the operations of the Yukon Gold Co. when their system is completed. They will operate seven dredges and three hydraulic elevators. Experiments with quartz lead to the belief that the time is not far distant when numerous quartz prospects will materially contribute to the wealth of the territory.

LOS ANGELES.

New Record Gusher at Coalinga. — Development to South

The record well for Coalinga, judged from the spectacular standpoint as well as from the standpoint of actual production, is the Silver Tip No. 1, on section 6, T. 21 S. R. 15 E., which recently flowed 22° gravity oil at a rate conservatively estimated at from 12,000 to 20,000 bbl. per day. This well is in the same section and but a short distance away from the famous Lucile, and is situated but a little more than a mile west of the town of Coalinga. The phenomenal flow began at 4 a. m., September 22, and continued to 9 a. m. September 23. It has been producing almost continuously ever since, and is at present yielding about 3000 bbl. per day with great quantities of gas. Nearly all of the oil has been saved, owing to the prompt work of those in charge. The well gushed for a few hours over a month ago, at which time large quantities of sand were thrown out with the oil. The present flow is, however, accompanied by relatively small quantities of sand as compared with the first flow or with other gushers, such as the Guthrey No. 1, which has made history for other parts of this same field, and it is quite unlikely that the sanding troubles encountered in so many wells will interfere with the Silver Tip. Several other wells in section 6, such as the Blue Moon, Jefferson No. 1, and De Lux, are giving promise of making big productions as soon as they are completed.

The wells of the American Petroleum Co., which have been such excellent producers, have steadied down to a yield estimated at about 5000 bbl. per day. When these wells were first brought in they produced over 7000 bbl. per day. Such decrease in production is always to be expected. The Nevada Petroleum wells, just east of those of the American Petroleum Co., are now being cemented above the 'Zone D' or deep oil sand, the same from which the Lucile, M. K. & T., and other deep Westside wells obtain their oil. The deep sand is present in all these wells but as yet has not been tested. Development is going forward rapidly in the Westside territory, among the most active operators being the K. T. & O. (Southern Pacific), which is endeavoring to protect its immense and until very recently large undeveloped properties. Water is causing much trouble in the Eastside field, especially in the east half of section 22, T. 19 S. R. 15 E. It is the belief of those well versed in the underground geology of this territory that much of the water is 'stray water', that is, water that has gotten into the formations associated with the oil sands during the drilling of the wells up the dip of the strata from those in which the water is now being encountered.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Discovery of the Great Comstock Mine.

The Editor:

Sir—Reading in the MINING AND SCIENTIFIC PRESS of July 3 of the fiftieth anniversary of the discovery of the Comstock mine recalled my experience with the event. Being one of the first to arrive on the scene, I note some discrepancies in the dates given, the discovery having been made earlier in the year. In 1859 I was living on Montezuma hill, Nevada county, about seven miles north of Nevada City. When the reports were circulated in March that rich mines had been discovered at Washoe, all that was known locally was that a valley by that name lay just east of the State line opposite Nevada county. There being no telegraph nor even any mail service, the reports were meagre and little could be learned concerning the new strike. John Terry, a mine-owner on Montezuma hill, suggested that we go over the mountain as soon as the trails were free of snow, which would be about May 1, or perhaps a little earlier. When the time came for the start the news of the wonderful find had spread all over the country, and the trails were alive with stampeders, both on foot and horseback.

Mr. Terry, myself, and two other miners were among the first to 'hit the trail'. We soon fell in with R. H. Warfield and O. H. Pierson from Marysville, who joined our party. We were several days in reaching the Truckee river, at a point about halfway between the present towns of Reno and Truckee. On reaching the Washoe valley we were told that the new mines were over on the eastern slope of the high mountain to the east of Washoe valley, some 15 miles. The trail over the mountain was rough and there was much speculation in our party as to what kind of a mine could exist in such a mountain. After passing up through a steep rocky canyon, we reached the summit of the divide, and passing over to the north side of Mount Davidson, found the dim trail that led us around to the eastern slope of the mountain, where we found four or five men at work in a pit which was about 10 ft. deep, about large enough for two men to work in, say 10 ft. long by 6 or 8 ft. wide, and about 8 ft. deep. On the lower side of the pit they had two rockers and a stream of water, which they had brought down from a spring above and around on the northeast side of the mountain; this stream was very small and was conveyed in a ditch about like a small plow furrow, the water barely reached the pit. It gave enough to run the two rockers by sinking two small holes about 2 ft. deep for the water to accumulate in. Pat McLaughlin, Peter O'Riley, and two other men were there at work in the pit. Mr. Comstock was down in the canyon cutting poles to build a frame for a canvas house. At that time, early in May, they were camped under a juniper tree about 100 yards above the pit on the side of the mountain. We all rode up

to the pit and sat on our animals watching the work which was a new kind of mining to us. The dirt being washed in the rockers was a decomposed gossan. The hard lumps were being piled at one side. None of us had ever seen such a mine. We expected to see gravel with free gold in it, as in California. One of our boys had the hardihood to ask where the new mine was, not taking any stock in that stuff. They were getting quite a lot of mineral, which to us, looked like lead. It seemed to have some kind of metal in it but no one seemed to know what it was worth per ounce. Some said it was worth \$10 per oz. and others said \$4. No assays had been made and but little sold, so no one really knew. Late in the afternoon, our party started for Carson river. We had not got out of sight of all there was of Virginia City at that time, when we met a man with an axe on his shoulder. His clothing was in rags and he was about as tough looking an individual as I ever ran across. The man proved to be H. T. P. Comstock, and was very talkative. We all stopped in the trail to hear what he had to say. He squatted down on his axe-handle and made us a proposition to the effect that if we furnished the grub and tools, to run an adit some 100 ft. or so to tap the lode 50 ft. below the surface at the pit, he would give us 50 ft. on the ledge—locations were reckoned by the foot at that time. Our party was so impatient to get away from the place that they would hardly hear him through, and we all rode away disgusted with the whole country.

R. H. CAMPBELL.

Seattle, September 24.

Wilfley Tables as Classifiers.

The Editor:

Sir—The use of Wilfley tables as separators of slime from sand, referred to by P. R. Whitman in the discussion on 'All Sliming', in your issue of September 18, is a matter of great interest, and the wonder is that this method was not generally adopted years ago. In your note appended to Mr. Whitman's communication you state that the system was in use at the Exposed Treasure mill 'as early as 1902'. It was first in use there in 1901, and early in 1902. W. K. Reese, who was then in charge of the cyanide plant, found that by so placing a short piece of board that it could be moved backward or forward under the discharge-lip of the table, quite a clean separation could be made, all the slime being discharged into one launder and clean sand into the other. By means of this slide any variation in the amount of slime in the pulp could be taken care of, and by proper adjustment of the table and of the wash-water, a practically perfect separation of slime from sand was made.

The Exposed Treasure pulp contained a large amount of 'real slime', that is, clay, and previous to the use of Reese's slide on the Wilfley, it was frequently impossible to get a leachable product in the sand-percolating vats. After its introduction the sand vats gave no trouble. One objection to this use of Wilfley tables might be the small capacity compared to cones or to Dorr classifiers, but, as it does not interfere in any way with the simultaneous use

of the table for concentrating, it would be specially suitable in mills treating gold and silver ores by concentration and cyanidation. It is also to be noted that by excluding cones or other classifiers, a saving in the cost of installation and a simplification of the plant is made, the saving in vertical height alone being in some instances of much importance.

BERTRAM HUNT.

San Francisco, September 21.

The Editor:

Sir—In a recent number of the MINING AND SCIENTIFIC PRESS inquiry was made as to the first use of the Wilfley table as a classifier. In 1897, at the Revenue mill, at Ouray, Colorado, the sand-free slime was sent from the head of the tables to canvas-tables 50 ft. long on which the gray-copper slime was saved. W. A. Garrett was superintendent of the mill.

H. W. REED.

Salt Lake City, September 24.

A Vein and Its Apex.

The Editor:

Sir—The importance of common understanding in the usage of terms warrants discussion particularly of those which are necessarily important in litigation. I submit the following as representing usage. Exactness in a scientific sense is necessarily often modified in practice by the legal situation. That is, one term is interpreted in the light of previous court determinations.

A vein (or lode) is an (1) elongated or tabular body of mineral matter, (2) in place (3) which extends with notable continuity through the mass of the country rock (4) definitely and visibly bounded on either side, or, lacking this, distinguishable from the country by the composition of its materials, and (5) as a mineral deposit, derived from sources external to the adjacent rocks. These characteristics of form, composition, and genesis, though often inaccurately conceived in detail, are nevertheless all involved in the prevailing idea of a vein among miners in the United States.

The apex. Fundamentally, the apex is the outcrop of the vein, if outcrop exists. Many veins, however, are not exposed at the surface. The top of the vein may be covered by soil, by a deep mantle of glacial debris, or by loose rock accumulated by landslides or snow-slides, or by volcanic ejectamenta of later age than the vein. More rarely a vein may terminate upward, for other geological reasons, against some particular rock formation or against a fault which has produced such great displacement as to totally isolate a part of the vein making it legally a separate vein. The miner also differentiates between dislodged vein matter and vein 'in place'. Fragments of vein matter separated from their original position at the top of the vein and scattered down a hill-slope by erosive agencies are called 'float'.

Vein matter. Vein matter may be defined as any mineral or aggregate of minerals which the miner has found by experience constitutes or is associated with commercial ore in a lode. In exceptional cases,

precisely the same minerals may be found disseminated through the country rocks or as erratic aggregates, and even, in certain rare instances, sufficient in quantity to render great masses of rock commercial ore capable of profitable extraction if worked on a large scale by the application of expedients of economy, like the porphyry bodies of Kelvin and Bingham. Such bodies lack the essential characteristics of form and structure, and generally of genesis, as comprehended in the prevailing conception of a vein or lode, and are called 'masses' or 'deposits'. They are not regarded as having apices, as the apex is understood in the procedure of locating and patenting lode mining claims. The 'apex' must, therefore, possess all the essential features of form and structure exhibited by the deeper parts of the vein, of which it is the top. It may be radically different in color, due to weathering, may be greatly enriched or it may be leached and robbed of value, but it must be vein matter. The apex, comprehensively defined, therefore, is the line drawn through the highest points at which the vein as an intact body is found in place when followed upward along its dip.

Ore. An ore is any mineral or aggregate of minerals which may be removed from the rocks of the earth and sold with profit, or which, with the application of progress in invention or change of conditions shows promise of becoming a source of profit. The term ore is most frequently applied to the metallic minerals. The metallic substances which are converted from their natural state to human uses in the arts and industries are subject to varying difficulties of recovery, on account of their geological or mineralogical associations, geographical situation, the natural facilities or the necessary capital for their exploitation, the stage of progress in the technology of their treatment and the vagaries of market. Since an ore is essentially a commercial substance, that may become an ore in the future which is not an ore today, or vice versa.

I hope that discussion may lead to increased uniformity in the use of the terms selected.

J. W. FINCH.

Denver, Colorado, September 11.

Sweden has lately felt secure as to future iron ore production, according to E. D. Winslow, Consul-General at Stockholm. The Swedish deposits in the north are very large and are now being worked by modern methods. There are reports of large finds in Ouenza, in Algiers, and already the Krupp, Gelsenkirch, and other large firms have formed a company to work them. Germany has been the main customer of Sweden's iron ore, but the news of the reduction of the American duty on the crude ore has made the Swedish iron-ore exporters look for a market in the United States, and already some 200,000 tons are on the way to Philadelphia.

Reports from Brazil speak of large discoveries of iron ore in that republic, but although the report of the Government of Brazil lately issued is sensational, no large production is expected from that quarter for a few years.

located as a mining claim adjoining the No. 1 North, and both the above homestead entries conflicted with his ground. He had done his assessment work for years, and, like the Osseo owners, had not known of these homestead entries. In September, 1905, he entered a contest against both Beyea and Strickland on the ground that they had not complied with the statutes governing homestead entries. Neither of these men could be found when, on October 27, this contest was heard. Beyea's entry was cancelled because seven years had expired and he had not 'proved up'. The other contest was reported as decided in Blackwell's favor by the local land office, but on reference to Washington for approval was decided against Blackwell on the ground that there was no proof that he had mailed notice of the contest to the last known address of Strickland, regardless of the fact that it was known that Strickland had left that part of the country and the postmaster had no forwarding address. Before this decision was rendered it had become necessary to take action as to the assessment work for 1905, and men were kept at work until that for 1906 was also completed.

In February, 1906, the Blackwell contest against the Strickland homestead was re-instated by posting a notice on the property, and mailing one to the last address, as required by law, and November 9, 1906, the local land office accepted proof, and again forwarded the decision to Washington for approval. A representative of the Osseo company visited Washington in December and was told that if Blackwell's contest was approved, Blackwell would have 30 days' prior right to file on the land covered by the entries of Strickland and Beyea, and if his filing covered Osseo ground no objection could be interposed at the land office, as the Osseo company failed to appeal from the decision of the local land office when first advised of the conflict with the homestead entries. The information was also given that Blackwell could acquire this land with scrip, or a soldier's right, without advertizing, thus giving the Osseo company no chance to intervene. January 22, 1907, the homestead entries were cancelled, and, as Blackwell did not exercise his 30 day right of priority to file on the ground, the application for the Osseo patent was again presented at the local land office. The following July this application was again denied on the ground of conflict with the S. W. $\frac{1}{4}$ of the N. W. $\frac{1}{4}$ Sec. 15. In the meantime the history of this quarter section had been investigated and it was found that the inhabitants of a small town which is situated here had appointed Judge Wilson trustee, and through him had, in 1900, purchased this land for cash. While Sec. 16 of the Act of March 3, 1891, provides that town-sites on mineral lands shall acquire no title to veins, or to any valid mining claim, the owners of the Osseo decided to except this area from the application. October 21, 1907, the amended application was accepted and publication ordered. On December 1 all papers and proofs were filed at the local land office and the money for the land paid to the Receiver. For some reason a duplicate receiver's receipt was not obtainable, but no assessment work was done for 1907 as the company was advised by its attorney that it was not necessary, the

courts having decided that "an entry made is in all respects equivalent to a patent issued, in so far as third parties are concerned."

The following April, 1908, inquiry at Washington disclosed the fact that no money had been received there, and later investigation showed the receiver of the local land office to be short in his accounts. In February, 1909, notice was received that the application was 'suspended', with the following comment:

"(1.) Some claims do not appear to have the necessary five hundred dollars worth of improvement; if benefitted by the amounts on other claims a report is necessary from the deputy mineral surveyor, certified to by the Surveyor-General. (2.) No application to purchase appears with the papers. (3.) Proof of continuous posting during the period of publication is made by a stranger to the record."

Objection No. 1 was taken care of as suggested; No. 2 had been filed, but lost at the land office, and was replaced with a duplicate; No. 3 was explained by affidavits that the owners and attorneys did not live near the property, and the 'stranger' did. Early in March, 1909, the receiver's receipt for the application fee paid December 31, 1907, came to hand, and on March 14 was received 'Register's Final Certificate of Entry', reciting that the party has "this day made payment," although the money was actually paid more than a year before. It is presumed that the papers have now gone to Washington for discussion and criticism by the officials and clerks of the General Land Office. The owners hope that the period of five years which has elapsed since proceedings for patent were instituted may not be duplicated before they receive actual title to the property.

The history of this effort to obtain a satisfactory title to mineral land furnishes another striking example of the unsatisfactory condition of those laws of the United States under which mining property is developed on the public lands. This ground, originally a productive placer, then held for years as a quartz claim, and during that time yielding several thousand dollars, was in part entered as a homestead, and so appeared on the land office records for years, without the knowledge of those who supposed they held it as mineral land by right of location and performance of annual work. To be sure the homesteaders did not attempt to 'prove up' and acquire title, but if they had attempted to do so there is no certainty that it might not have been accomplished. The adjoining land to the north is so held, several obliging neighbors having made affidavit to the fact (?) that it is not mineral land. I do not know enough of this adjoining property to state definitely that it is more valuable for its mineral, though examination shows on the ground a long open cut, and shallow shaft, with a very pretty quartz vein containing sulphides. It certainly does not look like a very valuable farm.

Title to the Osseo ground might easily have been obtained under the homestead law within the period during which the mine was closed down, and visited by the owners, or their representatives, only for the purpose of doing the annual work. When this is done at the same time for two years, during Decem-

ber and January, a property may not be visited for 22 months. The statement made by the Commissioner of the Land Office, that the property covered in part by the Osseo claims could be acquired with 'scrip,' or by 'soldier's right,' without advertizing, leaves holders of mining claims, located on land which may be valuable for agricultural purposes, absolutely without protection, unless application for patent be made. Fortunately this condition no longer exists, a rule having been adopted by Mr. Ballinger, when Commissioner, in February, 1908, requiring "in cases of applications to locate all scripts, warrants, certificates, soldier's additional homestead rights, or to make lieu selections of public lands," an affidavit that the land is not occupied adversely, accompanied with publication and posting of notice.

Another portion of this property was included in a tract actually sold for cash to Judge Wilson, acting as trustee for parties living upon it. It is evident that in such a case as this a prospector living at a distance, and possibly even residing on the ground, might have his entire property transferred to another without his knowledge.

Another point brought out by this history is the lack of value of the ordinary abstract of title to a mining claim. How valueless such an abstract may be is shown by the reply of the attorney when questioned. He said: "Our abstract was simply of the Osseo claims as located, and not of a particular subdivision of land. Hence it might have had numerous conflicts with other claims, other subdivisions, and not be noted. Similarly an abstract of title to the S. W. ¼ of the N. W. ¼ of Sec. 15 would not disclose the existence of a mining claim anywhere." Many Eastern investors, when acquiring mining property, send out an attorney to investigate the title. This attorney usually goes through the records of location, transfers, and mortgages, but how many attorneys from the East would look up the title to the section on which the ground is located? A mining man, going over the ground, can be fairly certain, judging by the presence or absence of stakes, as to whether there are conflicting locations. The testimony of an old resident of the district aids in the conclusion. But in spite of all the care of attorney, engineer, and old resident, the property may be acquired only to be confiscated by a cash certificate, or to be claimed by some locator whose stakes have rotted away. So great an uncertainty is a serious reflection on our law. Without working hardship upon those whose claims are reasonably protected under existing conditions, a slight amendment to our mining law would ameliorate this uncertainty for those who wish to take advantage of the provision I wish to suggest. Under our existing law the recording of mining locations is regulated by the laws of the State, or by vote of the miners of a district. The records are commonly kept by the county clerk, sometimes by a district recorder, but in no case are they known to the land office. The United States law should be amended so that : (1) the locator of a claim shall be permitted to file a location notice with the local land office for the district in which the claim is located, which shall contain such a descrip-

tion of the claim that its position may be identified and entered upon the proper plats and tract-books of said land office; and (2) when such a record is made no sale of public land in conflict with this claim shall be permitted without a reasonable prior notice being mailed to said locator. Such an entry should remain on the books of the land office as long as the locator makes annual affidavit that the annual work has been performed, but on failure to make such affidavit in any year the entry should be cancelled. Proper and reasonable fees to cover the cost of such entries could be charged, and would be very small in comparison with the increased safety of title to claims held simply by location and annual work, which claims, in so far as the United States, the source of title, is now concerned, are absolutely non-existent.

IRON-ORE IN CUBA.

The iron ores which have been mined in Cuba up to the present time consist largely of hematite and magnetite and are obtained near Santiago, in the Province of Oriente (Santiago). Recently large deposits of brown ore have been attracting considerable attention, especially those of the Mayari and Moa fields in Oriente Province and those of the Cubitas field in Camaguey Province. No ores of this type have been mined, however. The following table, prepared by E. C. Harder, of the United States Geological Survey, shows the shipments, in long tons, of iron ore from Cuba since the opening of the mines in 1884.

| | Tons. | | Tons. |
|------------|---------|------------|---------|
| 1884 | 25,295 | 1897 | 454,285 |
| 1885 | 80,716 | 1898 | 168,339 |
| 1886 | 112,074 | 1899 | 377,189 |
| 1887 | 94,240 | 1900 | 446,872 |
| 1888 | 206,061 | 1901 | 552,248 |
| 1889 | 260,291 | 1902 | 699,734 |
| 1890 | 363,842 | 1903 | 623,621 |
| 1891 | 264,262 | 1904 | 387,273 |
| 1892 | 341,654 | 1905 | 561,159 |
| 1893 | 351,175 | 1906 | 640,574 |
| 1894 | 156,826 | 1907 | 681,393 |
| 1895 | 382,494 | 1908 | 819,434 |
| 1896 | 412,995 | | |

By far the larger proportion of this ore came to the United States, the imports from Cuba in 1908 being 579,668 long tons. This was about three-fourths of the total imports of iron ore; in 1907 Cuba supplied a little more than half the ore imported.

In working garnet deposits the rock is broken down by ordinary quarrying methods. It is then crushed to release the garnets and the product is washed. Hand sorting and mechanical means are employed. The garnet rock worked is mostly amphibolite, and is usually schistose. There has been some difficulty in separating the garnet from the accompanying hornblende, but jigging has been found most efficient, as in the concentration of corundum. The output is used in the shoe and wood-working industries as garnet-paper. The mineral possesses no distinct cleavage, but there is a rather distinct parting parallel to the dodecahedral faces, insuring a smooth surface for adhering to the cloth or paper, at the same time leaving a sharp cutting-edge.

PAN-AMALGAMATION EXPERIMENTS.

By H. O. HOFMAN and C. R. HAYWARD.

*In smelting an ore by a well-established process, the result is shown by analyzing the products to see whether their compositions correspond to those calculated in making up the charge; by taking account of stock to show the distribution of metal in the different products made and the losses from dust and volatilization; by casting a thermal balance to find the distribution and losses of heat; and by making a cost-sheet to ascertain, as far as possible, the necessary outlay of money. In lixiviation and amalgamation, the mode of operating has to be varied to adapt a process to the individual ore. Here a number of tests become necessary. Each will consist of a series

to get them into good working-order, and of the difficulties met in making a clean-up, as it was next to impossible to recover all the amalgam from a pan with detachable shoes and dies. While the percentage of extraction is usually based upon the assay of the tailing, it is of importance in a teaching-experiment to compare it with the actual yield from the amalgam. Instruction was given mainly with small pans, only 7 in. diam., three of which were of copper, hardened by a small percentage of silicon, and the rest of cast-iron. These pans were a great advance over the original Washoe model, but improvements in the details of construction suggested themselves, which led, in 1899, to the replacement of the pan of 1895 by the present form. This has met all the requirements of a pan that is to be used for class-work in the systematic testing of ores. These

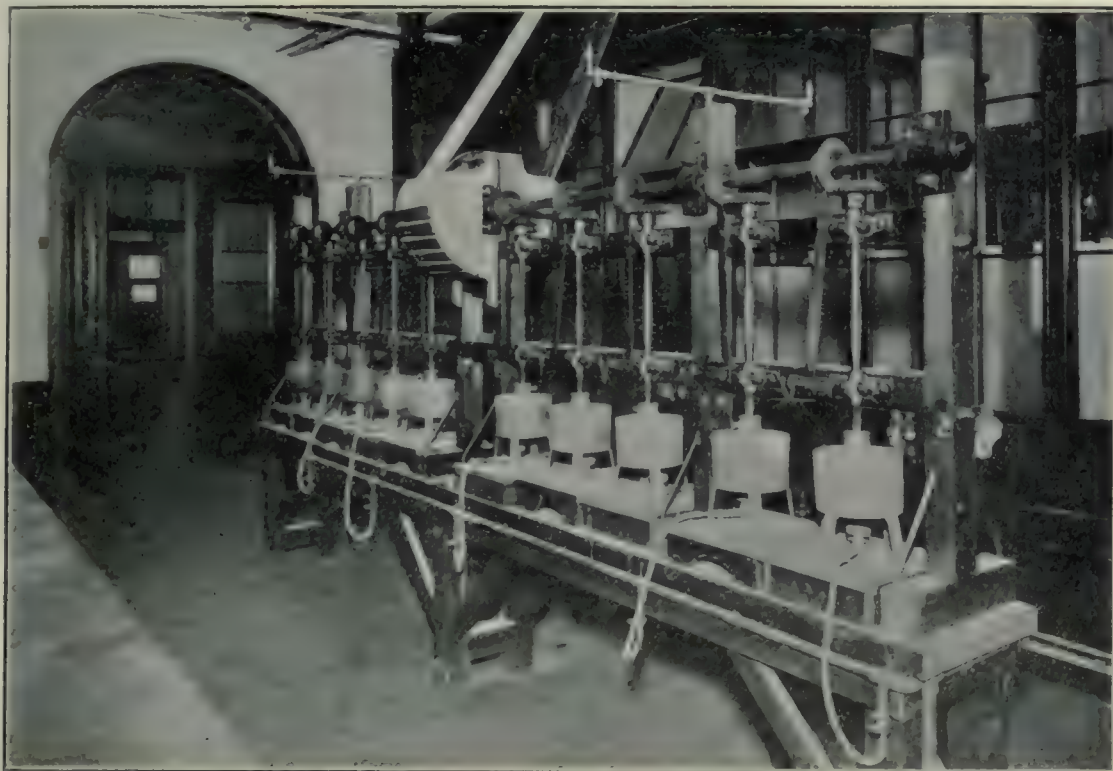


Fig. 1.

of experiments with one variable, in order to find the conditions under which the variable gives the best result; a summary of several tests will give the best method of operating. Working a number of charges with the best method will furnish the data desired for ascertaining the recovery of metal, the size of plant needed for a given capacity, and the cost of treatment.

The Washoe process, raw-amalgamation of a silver-ore in an iron pan, furnishes a satisfactory example of this class of ore-treatment. The first amalgamating-pan with settler was put in operation at the Massachusetts Institute of Technology in 1871. It was built on the Washoe pattern by Booth & Co., of San Francisco, California. In 1895 the laboratory had three of these pans, respectively 30, 18, and 12 in. diam. They were, however, little used at that date for class-work on account of the time required

requirements are that it shall give a quantitative result which corresponds to working conditions, and that it shall be small, easy to run, and easy to clean.

Details of the pan are shown in Fig. 2 and 3, and the battery of 10 pans in the laboratory is represented in Fig. 1. The pan, Fig. 2, is cast in one piece. It has a flat bottom, which forms the lower grinding-surface; its inside dimensions are: diameter at bottom, 7 in.; at top, $7\frac{1}{4}$; height, $4\frac{5}{8}$. In the centre is a hollow core, $2\frac{3}{4}$ in. diam. and $3\frac{3}{4}$ high, to prevent the pulp from collecting. The pan has four legs, which stand on a wooden stool; the latter carries a flat evaporating gas-burner for heating (not shown in the illustration).

The muller, Fig. 2 and 3, is of special construction. It is cast in one piece, as is the pan. The upper part, the driver, is slipped over the rotating shaft and fastened to it by a set-screw; it has a vent, Fig. 2, to prevent hot pulp from being sucked into the core; the spider has two legs only; the form of the muller-

*Trans. Amer. Inst. M. E., June, 1909.

plate and shoes is shown in Fig. 3; details of construction are given in Fig. 2. The shoes have the usual form of an oblique sector of a circle. One peculiarity of the shoe, seen in half-section on *D E* and in section on *L M* in Fig. 2, and in Fig. 3, is that the part outside of the muller-plate tapers from $\frac{1}{4}$ in. at the front to $\frac{7}{8}$ at the rear end, and thus assists in the formation of a pulp-current by raising the pulp while the muller is being rotated through the driving-shaft. This shaft, Fig. 2, is suspended from a bevel-gear with hub, fastened to it by a set-screw, and journaled in two boxes bolted to a wooden frame common to the 10 pans, Fig. 1. The bevel-wheel is driven by an adjustable bevel-pinion, which is thrown in and out of gear by a forked lever (stopper), the arms of which end in a grooved hub; the lever is supplied near the bottom with a hook, to be

tion of water during the grinding and amalgamating-periods, which has to be remedied by adding fresh water, in this case from a wash-bottle holding 500 c.c. The amount used is noted, as it gives an idea of the care with which the heating has been carried on. Allowing the pulp to become too thick requires an excess of water over the normal to thin it down in order that the desired current may be again established. In the experiments the water-additions ranged from 465 to 869 c.c. Water from the wash-bottle should be blown in small amounts against the side of the pan; it will loosen parts of the top of the charge which have adhered to the warm pan and become hard; the pulp-current then will carry them toward the centre and cause them to descend there. Scraping the sides with a spatula corrects the adhesion of parts of the charge, and has to be resorted

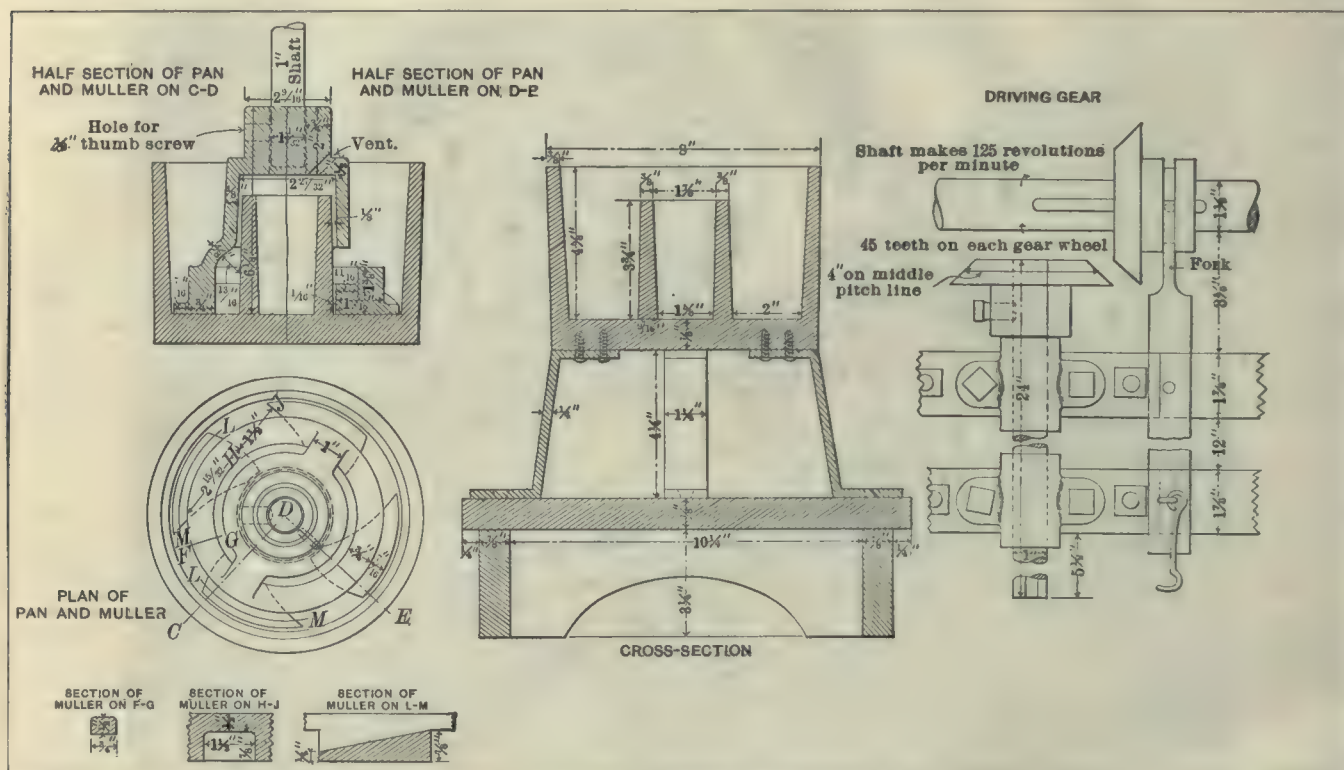


Fig. 2.

lowered into an eye (not shown) when the pinion is working.

The details of an operation may be given in connection with the plot in Fig. 4, which represents a series of 10 tests, in which the time of grinding was the variable, ranging from 20 to 100 minutes. The pan is first cleaned. For this purpose the muller is raised on the shaft and clamped, the wooden stool under the pan is withdrawn, the pan taken out and dusted, and the suspended muller freed from adhering particles of foreign matter. The pan is now put in place, the muller lowered, pressed down, and turned to and fro by hand and clamped. The necessary amount of water, 500 c.c., is charged, the muller set going, the lamp lighted, and the salt, 180 gm., added. The ore, 1800 gm., of 40-mesh size material, is fed in slowly, and the time of grinding counted after all the ore has been charged, namely, after about 5 min. On account of heating the pulp with a lamp to about 80°C ., there is considerable evapora-

tion of water during the larger part of a test, as repeated additions of water thin the pulp to such an extent as to spoil the current.

At the end of the grinding-period, the muller is raised $\frac{1}{8}$ in. previous to adding the quicksilver. In order to fix the distance, a pencil is held against the rotating shaft and a line marked off; the bevel-wheel is now thrown out of gear, the muller unclamped, raised, re-clamped, and set rotating again. A weighed amount of quicksilver, 150 gm., is then added during about 5 min. in a fine spray from a glass funnel on to the charge near the outer edge. The consistence of the pulp must be a little thicker than during grinding; the right degree will be determined by the manner in which the quicksilver is disseminated; this will be found in globules if the pulp is too thick, in fine particles if right, and will collect on the bottom if too thin.

In making a clean-up, the first step is to remove the tailing and amalgam from the pan. The muller

is stopped; a sheet-iron vessel, 18 in. square and 4 in. deep, having a thin coat of pitch and tar, is placed underneath the pan; the muller is again started, and first one litre of water added to thin the pulp, then two litres more in about 5 min., which causes a large part of the tailing to overflow into the vessel. The amount of water desired, and the time allowed for adding it, had been settled by experiment before

panning twice in a 16-in. gold-pan; the tailing goes onto the filter-cloth and drains over night, the amalgam, collected in a porcelain dish, is dried and weighed. The discrepancy in weights of quicksilver and amalgam in the table requires explanation. The combined weights of quicksilver fed, 150 gm., and silver contained in the charge, 5.449 gm., give 155.499 gm., while the weights of the amalgams recovered

show a range of from 156 to 164 gm. Part of this excess is due to a possible slight overweight in the quicksilver charged, part, however, to the presence of impurities in the amalgam. Thus, a partial analysis of retort-bullion gave: Ag, 51; Pb, 43.61; Fe, 5.12; Cu, trace; total, 99.73%. The 10 amalgams of a series of tests are placed separately in half-cylinder cast-iron vessels, transferred to a pair of retorts, and distilled in a two-muffle furnace, which is fired with soft coal; the muffles are 4 in. wide, 6 in. high, and 18¼ in. deep. Each vessel is coated with chalk, and receives a layer of paper before the amalgam is charged,

in order to prevent the retort-bullion from adhering to the iron.

The general arrangement of apparatus is clear from Fig. 5. It consists of two wrought-iron pipes, 3 in. diam. and 24 in. long, each closed at one end by a disc, ¾ in. thick, that has been welded in, and at the other by a reducing T, 3 by 3 by 1 in., and a reducing cross, 3 by 3 by 1 in., respectively, and

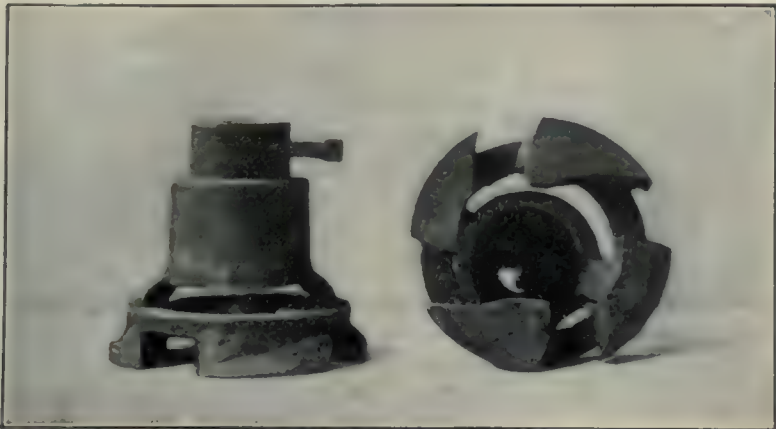


Fig. 3.

adopting this mode of operation. The rest of the pan-content is now transferred to a fibre pail holding about 2.5 gal., the pan and muller being scraped with a spatula and brushed with a dauber. The next step is the separation of the amalgam from the tailing and the recovery of the latter. The tailing collected in the iron vessel is transferred to a filter, which is a simple wooden frame, 18 in. square and of

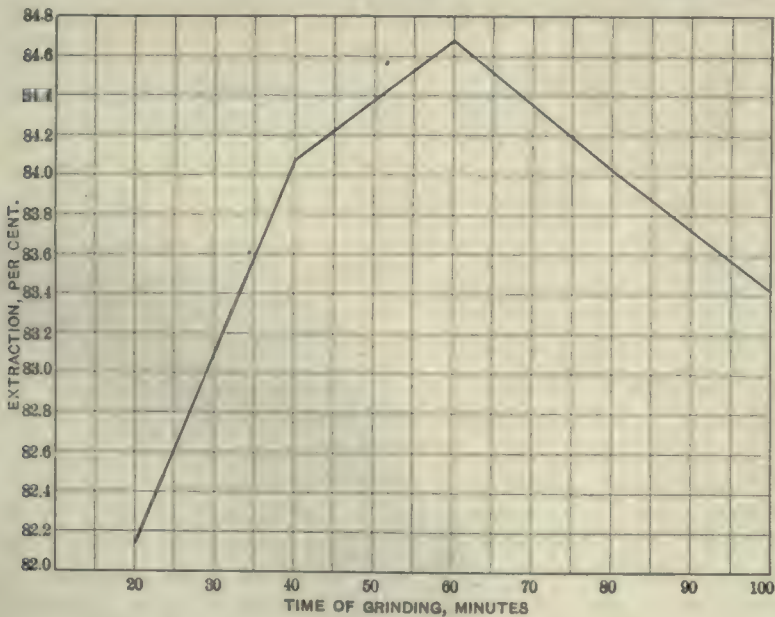


Fig. 4.

1-in. section, with heavy unbleached cotton cloth spread over it and nailed fast on the under side. The 10 filters are soaked for several hours in water before they are put to use, in order to close the pores. Nevertheless, small amounts of slime pass through, which are caught with the filtrate in buckets and allowed to settle over night, when the clear liquid is decanted and the slime collected from each filter, dried and weighed.

The tailing and amalgam collected are separated by

joined by a 1-in. connecting-pipe; the T and the cross are closed by square-head screw-plugs. Into the lower retort is screwed the condenser, which reaches into a vessel filled with water.

The quicksilver is driven off in about 3 hr.; the water in the condenser has to be replaced at intervals; a continuous flow of water was found to be unnecessary. The retorts and the furnace are allowed to cool over night.

The morning after the run has been made, the

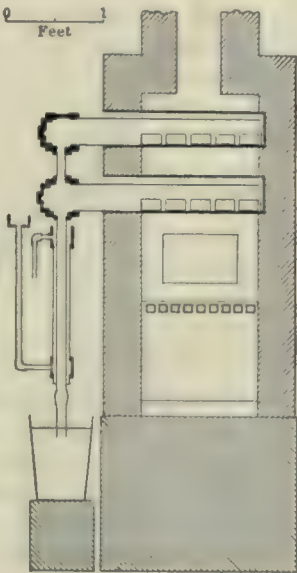


Fig. 5.

drained filters are placed on steam-tables to become thoroughly dry, and the retort is opened. In the afternoon, each student receives the tailing and the retort-bullion from his pan; he passes the tailing through a 40-mesh sieve to break up the lumps, samples down to 200 gm., crushes the sample through a 100-mesh sieve, and makes a duplicate assay; at the same time, he scorifies his retort-bullion and cupels it. By using a large muffle, $8\frac{1}{2}$ by 5 in., and 18 in. deep, a number of crucible-fusions can be made at the same time, and the work thus expedited. The re-

affects harmfully the pulp-current and flours the mercury, which increases the losses. Without a good current a satisfactory extraction is hardly ever obtained.

The following is a summary of a large number of tests made in extracting the silver from a single ore by raw-amalgamation in cast-iron pans of the construction given. They represent the first experiences of students in this kind of work, who, however, are familiar with assaying and panning. In the selection of samples only those tests have been omitted which in the class-conferences were decreed to be faulty for some well ascertained reason.

The ore is a silver-ore from the Palmarito Mining Co., District of Mocorito, Sinaloa, Mexico. An examination, aided by the microscope, showed that it was composed mainly of quartz and kaolinite, and contained besides some hematite, galena, pyrite, native silver, and cerargyrite. In the pulp, crushed by means of rolls through a 40-mesh sieve, were found particles of metallic iron. The ultimate analysis gave: H_2O , hydr., 0.07%; SiO_2 , 86.10; Fe, 6.68; Al_2O_3 , 2.66; S, 0.07; Pb, 0.28; Ag, 0.31 (98.1 oz. per ton); As, Sb, Cu, absent.

The rational analysis was determined by the following considerations: the Al_2O_3 was calculated as kaolinite (Al_2O_3 , 39.8%; SiO_2 , 46.3; H_2O , 14.9); the remaining SiO_2 was assumed to be quartz; the S not required by Pb to form galena was calculated as being bound to Fe as pyrite; metallic iron to the ex-

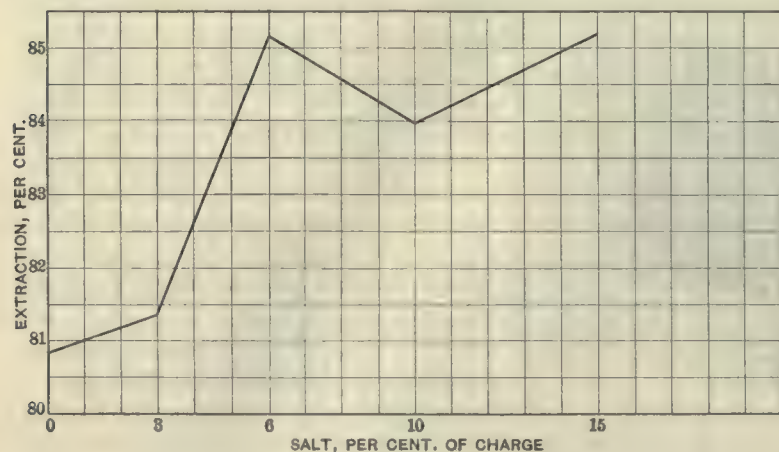


Fig. 6.

sults are handed to the instructor, who records the weights and assays.

The weights of tailing remaining on the filters range from 1775 to 1797 gm., equal to from 98.60 to 99.84%; those that passed through the filters weigh from 1 to 8 gm., equal to from 0.06 to 0.44%, which gives a loss in weight ranging from 1 to 20 gm., or from 0.06 to 1.11%. The weights of amalgam and retort-silver show some variations. The combined recovery in quicksilver from the 10 tests is high, 99.13%. In making up the silver-account, the tailing shows assay-values of from 13.92 to 16.86 oz. silver per ton. A pan was charged with 5.499 gm. of silver; this is the total to be found in the tailing and in the amalgam; the amount accounted for is seen to vary from 99.49 to 99.97%. The last two columns give the extraction in silver based upon the tailing-assay and upon the recovery in the amalgam. The former figure is, of course, the only reliable one, but the other column is added to bring out any contrasts which may exist. It is an accident that the figures of the two columns agree so closely; frequently considerable discrepancies occur, due to imperfect cleaning of the pan in a preceding test, or to hard amalgam adhering to the muller in one case and peeling off in another. Fig. 4, finally, shows graphically the extraction of silver as influenced by the time of grinding. It is seen to increase with the time of grinding from 20 to 60 min., when it reaches a maximum of 84.76%, and then to fall off. The probable reason for the diminished yield, after 60 min. of grinding, is the excessive sliming of the ore, which

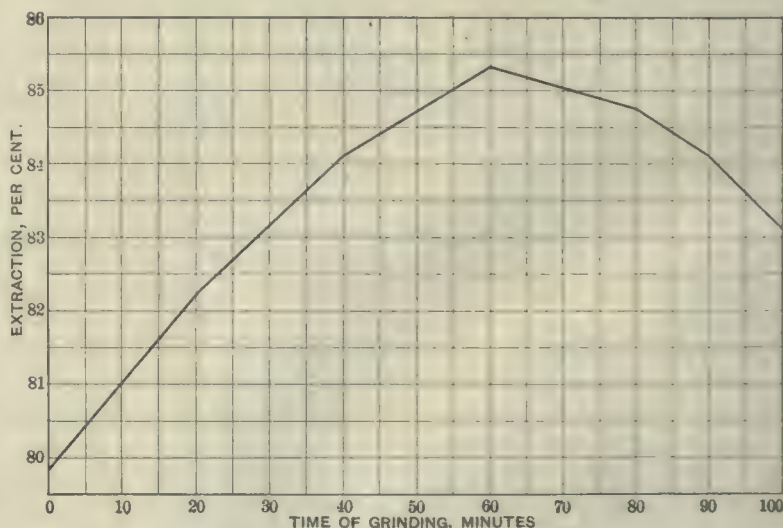


Fig. 7.

tent of 0.10% was extracted by a magnet from the pulp; the remaining Fe was figured as hematite; of the Ag present, 0.02% was extracted by means of sodium hyposulphite and calculated as cerargyrite; the rest was assumed to be present in the metallic state. This procedure was believed to be warranted by the facts that As and Sb were absent, that more than 70% of the total silver was amalgamated in 20 min., and that more than 80 was recovered in the pan in the absence of salt. The rational analysis of the pulp thus gave: H_2O , hydr., 0.07%; quartz,

83.01; kaolinite, 6.68; hematite, 9.36; galena, 0.38; pyrite, 0.06; metallic iron, 0.10; cerargyrite, 0.03; metallic silver, 0.29; total, 99.98 per cent.

In the tests there were examined the effects of varying the addition of salt, the time of grinding, the time of amalgamating, and, last, the influence of an addition of blue vitriol. Previous experiments had shown that, with a charge of 1800 gm. of ore, 500 c.c. of water at the start gave a satisfactory pulp, and 150 gm. of quicksilver an amalgam of sufficient liquidity to reduce the loss in panning to a negligible

the presence of any salt whatever points to the supposition that a large part of the silver is present in the metallic state.

The extraction, as shown in Fig. 7, is seen to resemble very closely that which has been previously given in Fig. 4.

The data, plotted in Fig. 8, show clearly the rapid rise in the extraction during the first hour of amalgamation, and the small increase during the next half-hour, when a maximum is reached. The slight falling-off later on is to be attributed to the inevitable flouring of quicksilver in every amalgamation-process, with a consequent loss in silver.

The addition of variable amounts of blue vitriol to the pan, as shown in Fig. 9, has no beneficial effect whatever; on the contrary, the extraction decreases. The irregularities in the results are due to the amalgamation of copper, which causes losses in panning and in the subsequent assaying.

The inferences to be drawn as to the treatment of the ore are that, with a charge of 1800 gm., with an addition of 500 c.c. of water at the start and smaller amounts later on to keep the consistence of the pulp constant, and with 150 gm. of quicksilver, 6% salt, 60 min. grinding, and 90 min. amalgamating give the highest extraction.

The data, and the curves drawn from them, show that the results are satisfactory. Considering pan-amalgamation as a laboratory-experiment, it teaches in a simple, quick, and effective way, with an apparatus that is inexpensive, the importance of series-work in making an investigation, and the value of taking account of stock; it further gives results that can be used as the basis for work on a large scale.

MINERALS IN ALSACE-LORRAINE.

The total mineral production of Alsace-Lorraine has increased from 1,000,000 tons, valued at \$1,190,000, in 1872, when it became a part of the German Empire, to 15,500,000 tons, valued at \$16,660,000, in 1908. The output of coal and iron ore in 1908 is given as follows: Coal, 2,367,742

tons, valued at \$6,880,818; iron ore, 13,281,589 tons, valued at \$9,190,608. As compared with 1907, the output of coal shows an increase of 173,500 tons, valued at \$880,600, while the output of iron ore shows a decrease of 826,000 tons, valued at \$1,309,000. The decrease in production of iron ore is reflected in the decreased output of furnaces, Thomas raw iron being \$5,236,000 less than in 1907, although the production of foundry iron increased from 340,000 tons in 1907 to 403,000 tons in 1908.—*Daily Consular and Trade Reports.*

For connecting water or steam pipes it is useful to remember that graphite compounds make a tight joint; at the same time that it does not set as does red and white lead.

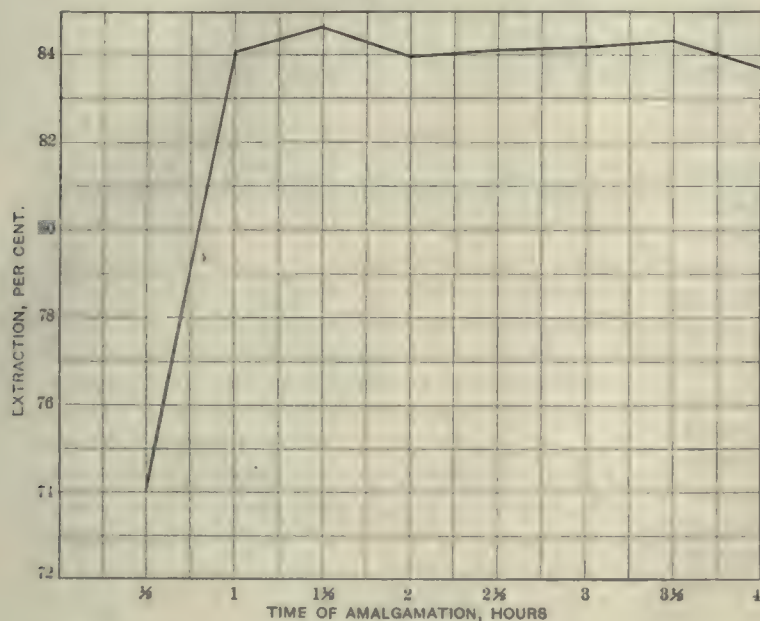


Fig. 8.

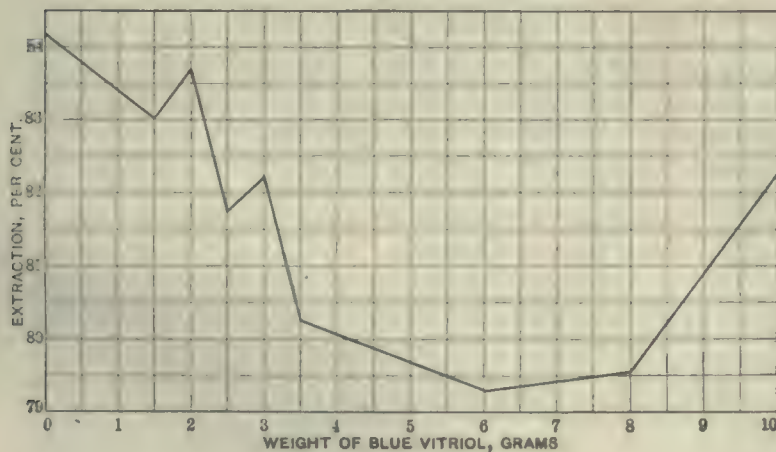


Fig. 9.

quantity. These three items, therefore, were kept constant in all the work, as well as the temperature, which was held at about 80°C.

The results, recorded and plotted in Fig. 6, show that, while the extraction in the absence of salt is high, it rises rapidly until 6% of salt has been added, falls with 10%, and rises again to practically the former maximum when 15% of salt has been charged. (The reason for the falling-off in extraction between 6 and 15% of salt is not clear, and will have to be looked into at a later date. The salt-series was the last one that was investigated; in the other tests the usual standard addition of 10% had been made; this explains the discrepancy between advocating 6 of salt and using 10). There is, therefore, no reason for going beyond 6%. The high extraction without

THE ARKANSAS DIAMOND FIELDS.

Written for the MINING AND SCIENTIFIC PRESS
By AUSTIN Q. MILLAR.

It is surprising to note the small number of geologists who have personally visited and studied the occurrences of peridotite, of the 'kimberlite' variety, in Arkansas which presents a field almost unique in the economic geology of America. This may be due to the prevailing impression that admittance has been denied to all comers, further augmented by frequent press-reports following that day in August, 1906, when a prospector picked up two glittering pebbles, subsequently identified as diamonds, and optioned his land. These parties sacredly guarded their rights to gain an opportunity to 'option' more, but the whole known area was not secured by them, nor were the further discoveries of diamonds limited to what these option holders would have the public believe was owned by them. There are three companies, one co-partnership and one individual holding, now owning rights to the diamond-bearing 'kimberlite' of Pike county. The total area is as yet unknown, but sufficient is known to warrant the statement that it will take many years to wash and search the disintegrated surfaces of the exposures before the more expensive treatment of the 'blue ground' becomes necessary. The mineral covers areas on sections 28, 21, and 14, in township 8 south, range 25 west, Pike county, Arkansas, easily accessible by way of Murfreesboro, the county seat, and now the terminus of the Memphis, Paris & Gulf railway.

The attention of these companies has been largely taken up by the exploitation of stocks, and no action has been taken to ascertain the average possible yield of diamonds. A total of perhaps a thousand stones, varying in size from minute fragments and crystals to six carats in weight have been found. These compare favorably in color, and average proportion of white stones, to those of the African mines, and in lustre are equal to the Brazilian diamonds.

The geology of the diamond-bearing mineral given by Branner and Brackett and later by Kunz and Washington, fails to note those characteristics of the rock proving its identity with the 'kimberlite'. This name was proposed by the late H. Carvill Lewis, of the Philadelphia Academy of Sciences, to designate that peculiar variety of peridotite more porphyritic than typical peridotites. The Arkansas peridotite is distinctly porphyritic, and inclusions of shale, sandstone, and metamorphosed rock are plentiful in the so-called 'green ground' and yellow ground of all the exposures.

Ilmenite, garnet, and olivine grains, and flakes of biotite, of the vaalite variety are not infrequently found in the disintegrated rock; also barite and magnetite. Blue ground cores show pyrite as a plentiful mineral. All these accessory minerals are prominent in the Kimberley mineral.

Beginning at the surface of an undisturbed area, or upon an area where erosion is not rapid, the 'black gumbo soil' is common.

Lying immediately beneath this covering, which seldom exceeds a few inches, the 'yellow ground' of the African miner extends to depths varying from 10

to 50 ft. or more, this being succeeded by a color-change to blue, the rock gradually becoming firm, and in greater depth extremely hard, yet when exposed to the weather it disintegrates quite rapidly, according to the depth from which it was taken. Intermixed with the yellow and blue ground of the Arkansas occurrences, masses of the hard, firm, fresh rock, like the 'hardibank' of the African diamond mines, is plentiful, and is especially noticeable on section 28, where a conical mass rises to a height of about 100 ft., apparently somewhat indurated by exposure; while other exposures of similar rock, occurring either as dikes or masses in the yellow and blue ground, show considerable effects of weathering. The disintegrated matter is indistinguishable from the disintegration of the blue ground. All this is in direct accord with the characteristics and peculiarities of the African kimberlite, which has produced practically all the diamonds of commerce for 35 years.

Considerable comment has been occasioned by local phases such as the 'green ground'. Much emphasis was given this feature of one of the Arkansas occurrences for the reason that the first discoveries of diamonds were made in this material. On one mine no diamonds have been found outside of a small area of moderately hard greenish-blue ground. Close examination reveals the fact that this covers a deeply eroded portion of the field, and its topography is such that erosion of the surface is constant and continuous, the yellow material being washed away to lower levels as fast as it is formed and thus constantly exposing ground, which, when moist, has the greenish cast that gave to it its name of 'green ground'. It is in reality the upper surface of the blue ground. When dry it is gray in color. Even this peculiarity of the Arkansas rock is not without its duplicate in Africa, for kimberlite, bearing diamonds has been found where only blue ground was exposed, the yellow ground being carried away as fast as it was formed.

On section 21, connected with the area of green ground mentioned, diamonds are found in the yellow ground and in the same disintegration on section 14. It is, therefore, obvious that the blue ground is the matrix and carrier of the diamonds from depth in Arkansas as in Africa, and the accompanying areas of 'hardibank' no doubt will in time prove to be 'horses'. The Arkansas deposits are assigned to a period preceding the Cretaceous. The economic importance of the Pike county kimberlite can only be determined by systematic work involving a large expenditure of money and time, but it promises well, and while too much attention has been given to the stock-selling side, legitimate mining is beginning to show favorable results.

Swedish iron exporters are jubilant at the prospect of lower duties on the raw product in the United States, and the prospect of German importers turning to new quarters for supplies is offset by the immediate opening of a new market in America. According to the latest freight quotations a rate of \$1.61 per ton from Lulea, Sweden, to Philadelphia, was made for shipments already negotiated.

SAMPLING METHODS.

By J. M. CAMP.

*Owing to the varying conditions under which iron ores must be sampled, both by the producer and the consumer, variations from any uniform procedure of sampling are inadmissible. The elements of time, size of shipment, kind of ore and other considerations are determining factors in the details of procuring the sample. Hence it is the purpose to render the following methods general in their scope, promulgating those ideas applicable in the broader sense to ore sampling, without attempting to prescribe for every varying and unforeseen contingency in the details.

All samples must be taken uniformly over the surface of the cars after being loaded, by taking a minimum of 12 places for wooden, and 15 places for steel

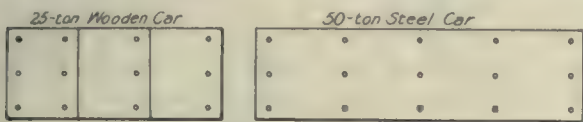


Fig. 1. Parallel System.

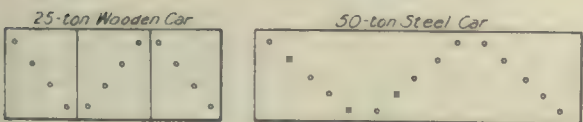


Fig. 2. Zigzag System.

load from all open-pit mines; a train consists of 40 to 45 of the 50-ton steel cars, or 60 to 68 of the 25-ton wooden cars. A moisture sample must also be taken for all the cars loaded at a shaft or stock-pile during each 10-hr. shift. Samples must be taken from three places on top of each car, as shown by Fig. 4. Care should be taken to secure the sample from well underneath the surface as soon as practicable after loading, maintaining the true proportion of lump and fine ore. The sample as taken must be immediately placed in a can with a tightly fitting lid, and brought to the crusher house. It is optional to take a moisture sample from the regular sample, provided it has been taken from well underneath the surface.

Cargo ores present the most serious obstacles to a uniform method of sampling. Boats vary in size from 3000 to 12,000 tons, with one or two decks, and in the number of hatches from 6 to 36, with widths varying from 12 to 24 ft. The grabs at the different unloading points vary in number, kind and size, and the rapidity of their operation. The ores vary from

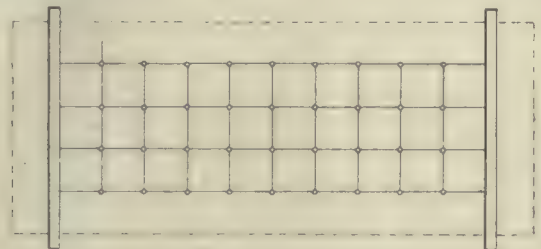


Fig. 3. Rope-Net System.

cars, by either the parallel or the zigzag system. The diagrams (Fig. 1 and 2) illustrate these systems and show the minimum number of points where samples are to be taken. When lumps of ore occur at the designated points where samples are to be taken, small portions of each lump must be chipped off, about equal in size to the first joint of the thumb. When rock occurs it must be sampled as ore, that is, a proportionate amount of rock or off-grade material is to be taken, not equal in amount to the regular sample for the area covered by that point, unless the entire area is such off-grade material. Then the same amount of adjacent material must be taken, of ore or rock, equal in amount to the portion taken at each regular point.

The samples are taken with a garden trowel. Each 10 cars, either steel or wooden, must be combined, as a rule, into one sample; but less than 10 cars may be grouped. The weight of the sample must not run under 15 lb. for 10 wooden, and 20 lb. for 10 steel cars. Whenever very lumpy ore is to be sampled in the cars, the rope-net system is used, as shown in Fig. 3, which gives about 32 places on each car, the knots being 18 in. apart. In using the net system, if a lump of ore or rock comes directly under a knot, a piece should be taken about the size of the first joint of the thumb. If fine ore occurs under a knot, an equal amount is taken with the trowel. The rope-net system is used on the Marquette range on the hard, lump ore; also at the Soudan mine, Vermilion range.

A moisture sample must be taken for each train-

the very fine to all-lump, from the so-called mixed ores, such as the groups to the mixed cargoes, consisting of different ores in the same boat, and with different ways of loading the boats.

An excellent method of cargo sampling where the entire cargo will be represented, and particularly adaptable for fine ores, is called 'grab-sampling'. A sampler with a scoop attached to a handle of suitable length and holding a definite amount of ore, a quarter, a half, or a whole pound, takes a scoopful from each grab as it rises above the deck. The disadvantage of this system is its increased cost due to the extra number of samples, one being required for each grab during the entire time of unloading.

The general plan for the sampling of all cargoes is to first sample the tops of the piles, before the grabs have started to unload; this is called sampling of the cones. After the grab has removed from the hatch all the ore within reach, the exposed faces standing on each side are sampled; this method is known as face-sampling. Or when the latter practice is impracticable, owing to the operation of the grabs, then the method of rounds is followed. In sampling, a small shovel or garden trowel is used, the total length of which, including the handle, is 12 in., and it also constitutes a measure. It is the aim to take equal sized samples from each of the points selected. When lump-ore or rock is found at the point determined by the measure, a portion is broken off equal to the amount regularly taken. In the sampling of the cones, at a point midway between the side and the centre of the boat, directly under the edge of the hatch, the first sample is taken and sampling continued one shovel-length apart up the surface of the

*Abstract of paper published in *Electro-chemical & Metallurgical Industry*, February, 1909. Method used by United States Steel Corporation.

cone, over its apex and down the opposite surface to a corresponding point under the other edge of the hatch. This line is crossed from corresponding opposite points under the hatch, as shown in the following sketch, Fig. 5. Not more than one tenth of the total sample is to be taken in the sampling of the cones.

After a grab has removed from a hatch all the ore within reach and has moved to another hatch, the sampler should measure two shovel-lengths from the side of the boat and start up the exposed face of the ore, taking samples one shovel-length apart all the way to the top, using a ladder if necessary. The next

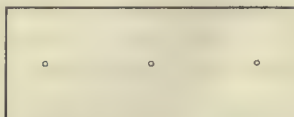


Fig. 4. Moisture Sample.

vertical line is measured four shovel-lengths from the first and the samples taken each shovel-length apart on this line as before, and so on for each succeeding line across the boat. This is repeated on the opposite ore face, and the entire procedure continued until the ore faces of all the hatches are sampled that the character of the boat and the operation of the grabs will permit. When a bulkhead occurs only the face opposite to it is to be sampled.

When the operation of the grabs makes sampling by the face method impracticable, or with boats having 24-ft. hatch centres, and decks furnish protec-

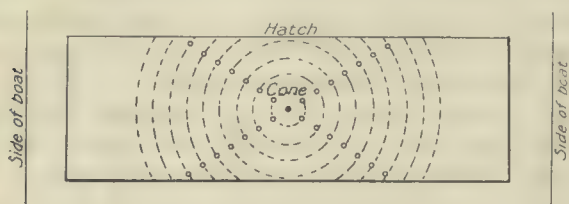


Fig. 5. Cone Sampling.

tion to the samplers, then sampling shall be done while the ore is being removed by the grabs. When 5 ft., or 6 ft. of the face of the ore has been exposed, the sampler shall enter the hatch and measuring two shovel-lengths from the side of the boat or edge of the face, take successive samples up the face one shovel-length apart. The next vertical line is measured four shovel-lengths from the first, and samples are taken all the way to the top as before, and so on across the entire face of the ore. This procedure is repeated on the opposite face, one third of the total weight of the sample to be taken in the first round. When all the ore within reach of the grab is removed, the second round is taken, using the measurements as above, and the remaining two thirds of the sample are secured. Part of the regular sample is to be taken for the moisture sample, and for the fineness sample when such is desired.

When the ore is received in cars the greatest possible number are represented in the samples, and not less than 10 equal-sized samples are taken from each car. When cars are loaded with fine ore, with the piles in opposite ends, at least five samples are taken from each pile, the first one at the apex of the pile, and the other four at points symmetrically arranged

around the sides of the pile, two thirds of the distance from the apex to the base of the pile or sides of the car. With cars loaded in the centre, the system is the same, except that the centre of the side of the pile lengthwise of the car is the first point, the other four being symmetrically arranged around this point. When the 10 points are located in a car, each of them is supposed to represent a definite area, equal to one tenth of the ore surface of the car. If the car contains all fine ore, then 10 equal-sized samples are taken, one from each of the points. If the car contains a mixture of fine and lump ore, with varying amounts of each in the areas included in the different divisions, then each area is judged separately and sampled accordingly. The fine and lump ore are taken each in its proper proportion, the former with the trowel, the latter being chipped, or selected small pieces being taken, each about the size of the first joint of the thumb. The combined sample of fine, chipped, and selected pieces from each area equals the amount taken were it all fine ore. If the content of the car is all lump-ore, the proper sized pieces are chipped from four or five lumps in each of

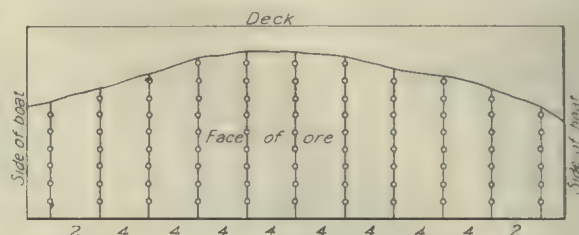


Fig. 6. Face Sampling.

the 10 areas, making 40 or 50 pieces from each car, the total amount of chipped pieces from each of the areas equalling the amount that would be taken were it all fine ore. All samples of fine ore are taken from well underneath the surface to obtain the ore in its natural state. A proportionate amount of the main sample is retained in a tightly closed can for the moisture determination.

In the preparation of the sample for analysis, the ideal practice is to crush and quarter alternately until the desired quantity with the requisite degree of fineness is attained. A more expeditious and equally efficient method, is to crush the entire sample to the desired degree of comminution, then reduce the quantity by successive quartering as before, until the desired amount remains. It should ever be the purpose to approach as closely as possible to either of these two methods in the preparation of all samples for analysis.

Briquetted fuel has been manufactured in foreign countries for many years. Railroads and steamship companies operating in certain countries are required to keep a reserve supply of fuel on hand, and briquettes are preferred because of their freedom from danger of spontaneous combustion, which frequently occurs in large piles of fine coal.

Zinc-oxide produced in the United States in 1908 amounted to 56,292 short tons, valued at \$5,072,460. This was a decrease of 15,492 short tons from the 1907 production. The average price in 1908 was \$90.09, and in 1907, \$90.47 per short ton.

VARA CONVERSION TABLE.

The accompanying table for converting *varas* into feet, prepared by Lee Fraser, is based upon the Spanish measure of that name, and the equivalence chosen by Mr. Fraser approximates that of the Burgos *vara* which is 2.742 ft. The importance of any such table is minimized by the difference in standards of measurement prevailing in the several Spanish countries. These differences are so great that one is tempted to risk a pun and affirm that the *vara* is a variable, and in truth its value has to be determined in each equation. In Mexico the *vara*, which now has no legal standing, was 36 Spanish inches. The Spanish inch, according to the best light we have,

SPIRIT LEVELING.

A recent publication of the U. S. Geological Survey (Bulletin 342) contains the results of spirit leveling done by the Survey in California for the years 1896 to 1907, inclusive, and forms a reference book of great value to engineers and surveyors. It comprises descriptions and elevations of bench-marks in 42 counties, which furnish vertical control for one-third of the State. The leveling since 1903 in the Sacramento valley was done in co-operation with the State. The lists are separated into two classes, precise and primary, distinguishing the degree of refinement in the method of leveling employed. The exact location of each bench-mark is described and its elevation

CONVERSION TABLE FOR VARAS AND FEET.
1 vara (castillian) = 2.7395 feet.

| Feet. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 0... | 0.0000 | 2.7395 | 5.4790 | 8.2185 | 10.9580 | 13.6975 | 16.4370 | 19.1765 | 21.9160 | 24.6555 |
| 10... | 27.3950 | 30.1345 | 32.8740 | 35.6135 | 38.3530 | 41.0925 | 43.8320 | 46.5715 | 49.3110 | 52.0505 |
| 20... | 54.7900 | 57.5295 | 60.2690 | 63.0085 | 65.7480 | 68.4875 | 71.2270 | 73.9665 | 76.7060 | 79.4455 |
| 30... | 82.1850 | 84.9245 | 87.6640 | 90.4035 | 93.2430 | 95.9825 | 98.7220 | 101.4615 | 104.2010 | 106.9405 |
| 40... | 109.5800 | 112.3195 | 115.0590 | 117.7985 | 120.5380 | 123.2775 | 126.0170 | 128.7565 | 131.4960 | 134.2355 |
| 50... | 136.9750 | 139.7145 | 142.4540 | 145.1935 | 147.9330 | 150.6725 | 153.4120 | 156.1515 | 158.8910 | 161.6305 |
| 60... | 164.3700 | 167.1095 | 169.8490 | 172.5885 | 175.3280 | 178.0675 | 180.8070 | 183.5465 | 186.2860 | 189.0255 |
| 70... | 191.7650 | 194.5045 | 197.2440 | 199.9835 | 202.7230 | 205.4625 | 208.2020 | 210.9415 | 213.6810 | 216.4205 |
| 80... | 219.1600 | 221.8995 | 224.6390 | 227.3785 | 230.1180 | 232.8575 | 235.5970 | 238.3365 | 241.0760 | 243.8155 |
| 90... | 246.5550 | 249.2945 | 252.0340 | 254.7735 | 257.5130 | 260.2525 | 262.9920 | 265.7315 | 268.4710 | 271.2105 |

1 foot = 0.36531 castillian varas.

| Varas. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0... | 0.0000 | 0.3653 | 0.7306 | 1.0959 | 1.4612 | 1.8265 | 2.1918 | 2.5572 | 2.9225 | 3.2878 |
| 1... | 3.6531 | 4.0184 | 4.3837 | 4.7490 | 5.1143 | 5.4796 | 5.8449 | 6.2102 | 6.5755 | 6.9489 |
| 2... | 7.3062 | 7.6715 | 8.0368 | 8.4021 | 8.7674 | 9.1327 | 9.4980 | 9.8633 | 10.2286 | 10.5939 |
| 3... | 10.9593 | 11.3246 | 11.6899 | 12.0552 | 12.4205 | 12.7858 | 13.1511 | 13.5164 | 13.8817 | 14.2470 |
| 4... | 14.6124 | 14.9777 | 15.3430 | 15.7083 | 16.0736 | 16.4389 | 16.8042 | 17.1695 | 17.5348 | 17.9001 |
| 5... | 18.2655 | 18.6308 | 18.9961 | 19.3614 | 19.7267 | 20.0920 | 20.4573 | 20.8226 | 21.1879 | 21.5532 |
| 6... | 21.9186 | 22.2839 | 22.6492 | 23.0145 | 23.3798 | 23.7451 | 24.1104 | 24.4757 | 24.8410 | 25.2063 |
| 7... | 25.5717 | 25.9360 | 26.3013 | 26.6666 | 27.0319 | 27.3972 | 27.7615 | 28.1288 | 28.4931 | 28.8584 |
| 8... | 29.2248 | 29.5901 | 29.9554 | 30.3207 | 30.6860 | 31.0513 | 31.4366 | 31.7819 | 32.1672 | 32.5125 |
| 9... | 32.8779 | 33.2432 | 33.6085 | 33.9738 | 34.3391 | 34.7044 | 35.0697 | 35.4350 | 35.8003 | 36.1656 |

is equivalent to 0.9275 English inch. Therefore the Mexican *vara* would be 33.39 English inches, or 2.7825 ft. In San Francisco the *vara* is still used in certain districts, where 50 *varas* are taken as 137.5 ft., which makes the *vara* equal to 2.75 ft. The values in English measure of the *vara* in several of the Latin countries is given by Halse in his valuable 'Dictionary of Spanish and English Mining and Metallurgical Terms' as follows: Argentina, 2.843 English feet; Brazil, 3.624; Central America, 3.239; Chile, Peru, and Portugal, 2.780; Colombia, 2.624; Cuba and Venezuela, 2.782; Mexico, 2.75 (in which re-appears the value assigned to it in San Francisco); Paraguay, 2.833; Uruguay, 2.904. The Century calls *vara* "a Spanish-American linear measure," ignoring its Spanish origin, and strangely credits it etymologically to Chile, without mention of the derivation from ancient usage, when a twig served for a measure in Spain as three barleycorns did in England. In almost all the Latin countries the metric system is now the only legal one.

in feet above sea-level, carried out as a rule to three decimal, is given. This work fills a long felt want by surveyors and others in California.

Zinc smelting in Europe is now controlled by two groups of operators. The first group comprises 18 concerns, principally the zinc works of Upper Silesia and Westphalia, certain Austrian concerns, and several Belgian works. This group is organized as a German company designated as Zinc Hussen Verband. In Silesia the Heritier George van Geische Co. has remained outside the syndicate, although in many ways closely associated with it. The production of the first group has been limited for 1909 to 255,086 metric tons and for 1910 to 264,232 metric tons.

The second group comprises the zinc works mainly situated in Belgium, notably the Vieille Montagne Co. The production for this group is limited for 1909 to 174,519 metric tons and for 1910 to 175,919 metric tons.—*Daily Consular and Trade Reports.*

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Treatment-costs at the Homestake mine, in South Dakota, are: milling and amalgamating, 44c. per ton; cyaniding, 18, and slime-treatment and construction, 24. The total cost is, therefore, 86c. per ton. The mining costs are approximately \$2 per ton, which seems high on so large a daily output as 4000 tons.

Since the recent California mining act went into effect all notices of location of lode or placer claims, or tunnel or mill sites within this State must, within 30 days after posting the notice of location on the claim, be recorded in the office of the county recorder for the county in which the location is situated.

Roll-feed may be either 'free' or 'choke', that is, the feed may be so regulated that the material fed passes as rapidly as it touches the roll, or it may be fed slightly faster, so that the full crushing-capacity of the rolls is presumably availed of. Choke feed increases the friction and the wear, and is not as good practice as the accurately adjusted feed.

Sulphur occurs in Japan chiefly at Volcano bay, in central Hokkaido, and the Kuriles. The sulphur comes mainly from near Hakodate, but there are mines also near Kuchan in Shikibeshi, and at Ishikaridake, Mount Akan, and Shari. Some of the deposits yield sulphur almost as pure as that produced in Louisiana. The exports are about 30,000 tons per annum.

Angle of slope varies with the material, gravel standing, though not securely, at 40° (equal to a slope of 1¼ to 1), while sand will stand at from 36 to 38°. Wet sand will not stand at such steep slopes, the angle of rest flattening out to about 22°. A soil-covered hill with low brush to protect it from wash, seldom exceeds in steepness an angle of 37 degrees.

Barium carbonate is mined in the Thuringian mountains, Germany, and is known as witherite. The barium carbonate commonly shipped to the United States is an artificial product, obtained by the treatment of BaS with CO₂ gas, and boiling. The material so made is used for the manufacture of bricks of even color and of terra cotta; it is also employed in the glass and earthenware industries.

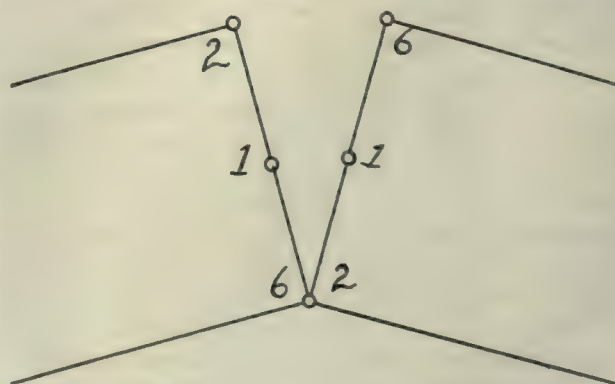
Saltpetre deposits occur in Chile throughout an area of 22,500 square kilometres, or 8687 square miles. This area is but 18 to 20 miles wide, and stretches along the Pacific Coast for over 450 miles. The deposits of *caliche*, or soda nitrate impregnation, are irregular, both as to extent and richness, but the total resources of the region are quite unknown. Estimates place the total available *caliche* at 340,000,000 tons, which would yield about 2,500,000 tons of saltpetre. At the present rate of exportation this quantity would last 136 years.

Quicksilver is reported from a point in British Columbia, occurring in small quantities in the gravel of a stream-bed. The geological formations adjacent are said to include schists and quartzites, overlaid at considerable altitudes above the creek-level by limestones. The statement is made that no mining has been done in the gulch, but this should be thoroughly verified before spending time and money in further search, since the quicksilver may have come from old workings. Prospecting might properly be done on the quartzite areas, and also in the limestone. The existence of native quicksilver in the stream-bed is no indication as to probable richness of any near-by deposit.

Thorium is obtained chiefly from monazite sand, which is found in the Carolinas, in Georgia, Idaho, Oregon, and in other States on the Pacific Coast. The content of ThO₂ in monazite sand varies from 0.01 to 7%. It is converted into the nitrate for use in making gas-mantles. The fluid used contains 99% ThNO₃, with 1% of cerium nitrate. The sands are first roughly concentrated in sluice boxes; the sluice-box product is then concentrated on Wilfley tables, and the latter concentrate is further cleaned by magnetic separators. The grade of material shipped carries from 98 to 99% monazite, which brings about 12c. per pound. Thorium is obtained as a nitrate in San Bernardino county, California, and is expected, shortly, to be available for the market.

Hardpan is defined as "the more or less firmly consolidated detrital material which sometimes underlies a superficial covering of soil." It is a term so general as to include many forms of deposit, being at one place the clayey material resulting from the washing down through the soil of the fine argillaceous particles, forming a dense sub-soil layer; at another place it may be a lacustrine deposit over which subsequent 'wash' has brought a soil; and it is sometimes a residual argillaceous layer formed on top of a decomposing rock. In engineering specifications it is unwise to attempt a definition of the term, but to indicate what is to be contracted for as 'hardpan' on the plans submitted.

Claims situated, as shown in the accompanying illustration, having one common corner, may have also a common monument or post at that corner.



The courts have held that a common initial or discovery monument for two claims is illegal, but that does not apply to other monuments.

Resolutions Adopted by the American Mining Congress.

(1) *Resolved*, That the President of the American Mining Congress appoint a committee of five members, who shall be known as the Committee on Revision of Mineral Land Laws, to whom shall be referred all literature, resolutions, and matters pertaining to this subject; that this Committee be authorized to submit its conclusions and recommendations to the President of this Congress, who shall transmit the same to the Sixtieth Congress of the United States; it being the sense of the American Mining Congress that a national commission be elected from the mining communities, in such manner and form as may be prescribed by the Congress of the United States, said national commission to prepare a revised code of mineral land laws, and report the same to the Congress.

(2) *Resolved*, That the State and county authorities in desert regions be urged to develop and safeguard desert water supplies, for the protection of life and health of miners and other travelers; and to this end erect suitable metal guide-boards, and provide for their protection under suitable laws; and further that the United States Geological Survey be authorized by means of specific appropriations, to co-operate, through the Water Resources Branch, with the local authorities, giving especial attention to the accurate location of desert water supplies on the public domain, their maintenance and preservation, and to the preparation of maps and reports, and the dissemination of information about them.

(3) *WHEREAS*, The general development of the commerce of the United States is important to the miner, as the increased production of minerals is vital to the commercial life of the nation; and whereas, a continually enlarging market is necessary in order to maintain the present increase of production of American manufactured products; and whereas, the increasing and ever fluctuating rate of exchange between this and silver-using countries appears to be working to the detriment of our trade with Oriental nations; now, therefore, be it

Resolved, That a committee of five be appointed by the President of this Congress, whose duties shall be to investigate the trade conditions existing between the United States and the silver-using countries, and report back to this Congress at its next session.

(4) *WHEREAS*, The production of gold and silver bullion in various sections of the United States is constantly increasing, and whereas, in many cases the nearest United States assay offices are situated at great and inconvenient distances from the points of production, and by this means many producers are put to great expense for the transportation of their product and long delays in receiving returns thereon; therefore be it

Resolved, That the American Mining Congress, in Goldfield assembled, herewith recommends to the National Government the establishment of United States assay offices, at such points as may be convenient for the receipt of bullion, and owing to the fact that bullion to the value of from ten to twelve million dollars per year is now passing through the city of Los Angeles, California, that city is recommended as one of the points especially covered by this resolution.

(5) To the Speaker of the House of Representatives and the President of the Senate: The American Mining Congress, in session at Goldfield, Nevada, again respectfully asks the Federal Congress to establish at its next session a National Bureau of Mines. An industry which yearly adds \$2,000,000,000 to the nation's wealth, which contributes 65% of the freight traffic of the country, gives employment to more than 2,000,000 men and serves as a basis of the nation's varied industries, is entitled to this recognition and aid from the Federal Government; while the waste of resources and loss of life in mining in this country are matters of serious national concern and deserve consideration and action by the Federal Government similar to that accorded to Agriculture and other great national

industries. The American Mining Congress urges that such action be taken without further delay.

(6) *Resolved*, That we recognize the value of the conservation movement to the mining interests, involving, as it does, the utilization without waste and the development free from monopolistic control, of the natural resources of the country, in land, water, forests, and mines, for the greatest good of the greatest number; that we also recognize the importance of the development of cheap water and electric power to the mining interests, and the importance of cheap water transportation particularly for the products of the mines, which are bulky and heavy and generally of comparatively low value; and we, therefore, endorse the movement for the development of the inland waterways of our country; that in aid of this, we favor the organization under the authority of Congress, of a national commission or board, composed in part of the chiefs of the scientific services of the country with a view to the formation and execution of comprehensive plans for the improvement and development of our rivers, including tributaries and source streams, not only for navigation, but also for the irrigation of arid lands, the drainage of swamp lands, the development of water power, the conservation of forest watersheds, and other related uses; and we favor the organization of similar commissions or boards, by the legislation of the respective States, with a view to co-operation between the nation and the States, and each acting within the limits of its jurisdiction.

(7) *WHEREAS*, The Federal Government, through the United States Geological Survey, is conducting investigations relative to the safety of mines, and those engaged in mining, which investigations are yielding results of great value, therefore, be it

Resolved, That the officers in charge of these investigations be asked to furnish the appropriate committees of the American Mining Congress such assistance as they can and as may be permissible under the statutes.

(8) *WHEREAS*, We deem it of the highest importance, not only for the Territory of Alaska, but also for the entire Pacific Coast and the American navy, that the valuable coal deposits in the Territory of Alaska should be opened without delay; and whereas, owing to the ambiguous provisions of Section 3 of the Act of May 28, 1908, wherein the titles to the land covered by claims taken, are liable to forfeiture to the United States if any of the provisions of said section are violated; and it has been found impossible to secure capital to develop the coal fields; therefore be it

Resolved, That the American Mining Congress in this twelfth annual convention assembled, does earnestly recommend: First. That the granting of patents to coal lands under the Act of May 28, 1908, be expedited. Second. That all claims located prior to November 12, 1906, by citizens of the United States for their own use and benefit, shall be speedily passed to patent thereunder. Third. That the said Act be further liberalized as to the area permitted to be grouped thereunder, and in such other manner as the Congress of the United States may deem wise, to the end that private enterprises may be encouraged and monopolistic control prevented. Fourth. That the third section of said act be modified in so far that the unlawful acts of the individual as contemplated in such act, shall in no event be sufficient to work a forfeiture of the patent issued to a company in accordance therewith; but that the unlawful act so committed should be dealt with and the individual be punished by fine and imprisonment, as in law directed, but this is not intended to apply to fraudulent entries. Fifth. That Congress be urged to set aside and reserve out of the unappropriated public lands in Alaska, an area of coal lands, sufficient to supply the quantity and quality of coal that may hereafter be needed for the uses of the Government itself. and be it further

Resolved, That a copy of this resolution be forwarded to the Honorable Secretary of the Interior and to the Senate and the House Committees on Public Lands.

(9) *WHEREAS*, The immediate development of the oil fields of Alaska has become a matter of vital importance to the commercial needs of the Pacific Coast; and whereas, the laws and regulations now in force have proven inade-

quate and inapplicable to meet the peculiar conditions surrounding the development of these fields; therefore, be it

Resolved, That the American Mining Congress in this twelfth annual convention assembled, urgently recommends to the Congress of the United States such immediate consideration and legislation as will encourage the speedy development of these fields. And be it further

Resolved, That a copy of this resolution be forwarded to the Honorable Secretary of the Interior and the Senate and the House Committees on Public Lands.

(10) WHEREAS, The law as applied to oil and placer claims in the Territory of Alaska, prescribing that annual assessment work be performed upon each claim to the value of \$100 per year, owing to the unusual circumstances, does not in the majority of instances, tend to the development of such claims; and whereas, the lack of adequate roads in the Territory of Alaska is a source of hardship and a handicap to mining development, of these resources; therefore, be it

Resolved, That the American Mining Congress in this twelfth annual convention assembled, does earnestly recommend to the Congress of the United States that the placer laws, so far as they apply to Alaska, be amended so that the owner of such claims may be permitted at his option either to pay into a special fund in lieu of assessment work, the sum of \$100 per year for each claim of 20 acres, or do the work itself and that the funds derived thereby shall be expended for the building of roads within the territory. And be it further

Resolved, That a copy of the resolution be forwarded to the Honorable Secretary of the Interior and the Senate and the House Committees on Public Lands.

(11) *Resolved*, That the President appoint a committee of three to co-operate with himself, in raising funds sufficient to enable the American Mining Congress to prosecute more vigorously and efficiently, the important work for the mining industry it is now undertaking to accomplish.

(12) *Resolved*, That a committee of five on legislation be appointed, the purpose and duty of which committee shall be to co-operate with the Secretary in securing the establishment of a National Bureau of Mines, and the enacting of such other Federal legislation as may be asked for in the resolutions passed by the American Mining Congress at this session.

(13) *Resolved*, That a committee of five be appointed by the American Mining Congress to consider and recommend such changes in existing Federal Statutes and Regulations, as will remove causes of friction and best promote friendly co-operation between the mining interest and the management of the National Forest; with a view to facilitate prospecting and mining within the national forests; that the Report of the Forestry Committee submitted to the Congress at this session, be submitted to the above committee for its information and consideration, and that the Forestry Committee be discharged.

(14) *Resolved*, That the President appoint a general committee of seven, including the Secretary, with a view to increasing the membership of the Congress.

(15) *Resolved*, That the American Mining Congress condemns all forms of fraudulent mine promotion and dishonest stock flotation, as being detrimental to the proper and legitimate development of the mining industry; that we favor measures for the exposure of fraud; and that we urge upon the legislature of the various States and Territories the enactment of stringent laws for the protection of investors, realizing as we do that a wise and judicious regulation will injure no one, and will be beneficial to the mining interest as a whole.

(16) WHEREAS, It is the sense of the American Mining Congress that the creation of a great merchant marine will benefit the mineral industry by expanding markets, and by attracting foreign ores, mattes, and other metallic products to this country for reduction by reason of the advantages of ballast rates which are afforded for such products when a large shipping exists; and whereas, such imports would enlarge the opportunities for the investment of capital in

smelters and refineries, and thereby provide a wider and more advantageous market for domestic ores and mattes; therefore be it

Resolved, That the American Mining Congress respectfully requests the President of the United States to make known to Congress the sentiment of this organization in favor of stimulating the growth of an American merchant marine by suitable legislation.

Pacific Stem Guides.

The D. D. Demarest Co., 503 Market St., San Francisco, is making a simple efficient device to replace wooden guides on stamp-mills. It consists of cast-iron frames, fitted with removable cast-iron linings. The linings are the only parts subjected to wear, and may be easily and cheaply replaced as they wear out. The linings fit into tapered sockets of the frame, and require no bolts, keys, or set-screws to hold them in place. Any one lining may be replaced without hanging up the other stamps in the battery. One point worth noting is that stems of different diameter may be used in the same battery simply by using the proper-sized liner. It is claimed that batteries equipped with these guides will require less attention and time in adjustments and lubricating than those having wooden guides, and will therefore leave the mill-man more time to devote to his plates. Circular No. 27 has just been issued, and it describes these guides in detail and gives a number of illustrations. The D. D. Demarest Co. also manufactures rock-drills, lubricating stop-cocks, drill sharpeners, Cornish pumps, air-compressors, and can furnish all kinds of mining and milling machinery.

Commercial Paragraphs.

The HUTCHINGS safety mine-cage device was placed on exhibition at Goldfield during the meeting of the American Mining Congress by G. B. Suter, of Denver, Colorado.

The GENERAL ELECTRIC Co., advises that it received grand prizes in every class of electrical apparatus in which an exhibit was made at the Alaska-Yukon-Pacific Exposition.

The ALLIS-CHALMERS Co., Milwaukee, announces that H. C. Holthoff, for the past two years manager of the Mexico office of that concern, has been made manager of the mining machinery department, with headquarters in Milwaukee.

HARRON, RICKARD & McCONE have removed their San Francisco office to their new building at 139-149 Townsend street. The location is easy of access and the building excellently adapted to the growing business of this pioneer concern.

The MINE & SMELTER SUPPLY Co., New York, announces that W. L. Loveland, lately manager of the mining machinery department of the Allis-Chalmers Co., has accepted a position as general manager for the former concern, with offices in New York.

WILLIAM H. WONFOR, of the Wm. POWELL Co., Cincinnati, Ohio, is leaving for a trip to Cuba, Spanish West Indies, and Mexico. This trip is in connection with the export business of the Wm. Powell Co., manufacturers of valves and steam specialties.

NORTHWESTERN UNIVERSITY has made an appropriation to equip an ore-testing laboratory. The old gymnasium has been remodeled and the front section will be occupied by the mineralogical department under the direction of D. F. Higgins. The metallurgical laboratory in the rear section will be made under the direction of W. H. Coghill.

THE GALIGHER MACHINERY Co., Salt Lake City, successors to the Utah Mining Machinery & Supply Co., announces that it is manufacturer and agent for the United States, Canada, and Mexico of the Isbell vanner. The announcement is accompanied by an illustration showing the general appearance and some of the constructional features of the new machine. A fully illustrated bulletin giving data from actual operation is promised for the near future. The Galigher Machinery Co. will be glad to receive the names of any interested persons, to whom the bulletin will be sent when issued.

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TABLE OF CONTENTS.

| | |
|--|------------------------|
| EDITORIAL: | Page. |
| Notes | 541 |
| Mine Inspection Again | 542 |
| Genesis of Petroleum..... | 543 |
| GENERAL MINING NEWS..... | 545 |
| SPECIAL CORRESPONDENCE | 550 |
| DISCUSSION: | |
| Abbreviating Code Messages..... | Mark R. Lamb 556 |
| Turquoise | E. Schaaf-Regelman 556 |
| Free Settlement Method of Separating Silmes..... | |
| ..... | S. Rivers Baildon 556 |
| Geological Survey of India..... | 557 |
| ARTICLES: | |
| Drilling in Alluvial Ground in Alaska..... | T. A. Rickard 558 |
| Determination of Silica..... | 559 |
| Protecting Steel from Corrosion..... | R. B. Woodworth 560 |
| Quicksilver at Huancavelica, Peru..... | |
| ..... | Lester W. Strauss 561 |
| Geology of the Coalinga Oil District..... | |
| ..... | William Forstner 566 |
| Round Mountain Mines and History..... | J. P. Loftus 568 |
| Round Mountain, Nevada..... | F. L. Ransome 568 |
| Five Hundred Horse-Power Electric Mining Hoist.. | 572 |
| Mineral Areas in Korea..... | 572 |
| CONCENTRATES | 570 |
| THE PROSPECTOR | 567 |
| DECISIONS RELATING TO MINING..... | 571 |
| DEPARTMENTS: | |
| Personal | 544 |
| Market Reports | 544 |
| Publications Received | 571 |
| Catalogues Received | 571 |
| Commercial Paragraphs..... | 572 |

EDITORIAL.

B IENVENIDO, Señor Don Gaspar de Portolá! Hace largo tiempo que sus pies no han pisado el suelo de San Francisco. Con gran gusto entregamos á V. las llaves de la hermosa ciudad. Tuvo V. que descubrirlo de nuevo. Después de haber sido destrozada por temblores y quemazones, las obras de varias generaciones quedaron como si nunca hubieran existido, pero la energía inagotable de los hombres del occidente ha resuscitado la ciudad de las cenizas, y ahora ofrecemos á su vista, Don Gaspar, algo mas grande que lo anterior. Situada en la Puerta de Oro, esta ciudad tiene probado su poder de continuar su carrera de conquistador, y mira ál través del Mar Pacifico en donde va á ejercer dominio por el arte de la paz. Viva Don Gaspar! Viva San Francisco!

K OYUKUK district, in Alaska, is attracting renewed attention. The output for the past season is estimated at \$350,000. New discoveries have been made on Nolan creek and so many men have been attracted to the area that a new town, Wright City, has been founded.

P ARACALE and Benguet districts continue to attract attention in the Philippines. Within the last three months more than three million dollars has been raised to develop the Paracale placer and quartz deposits. New Zealand capitalists were the pioneers in this district, but Americans and Englishmen are beginning to invest. Both districts are in a healthy condition and are producing at a good profit.

W INTER is at hand in the Far North. The *Victoria*, sailing from Seattle last week, is expected to be the last boat of the season to Nome. Regular communication will, however, be kept up by way of Fairbanks and the winter trail. Work on the Copper River railroad is not expected to stop and the *Leelanaw* is now loading with railroad material for Cordova. Bridge building will, in fact, be facilitated since false-work can be erected on the ice. Winter has largely lost its terrors in Alaska since trails, telegraphs, and steamers have become common.

GREETING, personal and cordial, between the chief executives of the neighbor Republics of North America, took place at El Paso and Ciudad Juarez on October 16. Courtesies were exchanged on both sides of the Rio Grande, and good-will was stimulated by a banquet in the Custom House in the Mexican city. A smile springs to the lips on reading that these chiefs of two great nations feasted off the elaborate silver service left in Mexico as a relie of

Maximilian's short-lived monarchic splendor. There was a touch of sardonic glee in that, perhaps more significant than was intended. Nothing more spectacular than the simple impressive fact of personal exchange of courtesies between Presidents Diaz and Taft occurred. No play upon popular passions was attempted; no empty words of flattery were expressed to tickle the ear. Dignity marked the entire proceeding, and the serious exchange of views was behind closed doors. For once Democracy demonstrated that it had not forgotten human nature in pretended open speech for the deified people. In fact, the signs of the times are that shirt-sleeves diplomacy is out of vogue, and Uncle Sam discreetly puts his finger on his lips upon occasions of prudence. The meeting on the Rio Grande is the most notable that has ever taken place between presidents. In 1879 President Hayes entertained President Barrios of Guatemala; in 1886 President Cleveland received President Zalvidar of Salvador; President Iglesias of Costa Rica paid his respects to President McKinley in 1895; and President Roosevelt visited his protégé, President Amador, at Panama in 1906. These were interesting incidents, but the meeting of Presidents Taft and Diaz looks to the strengthening of cordial relations between the United States and Mexico at a time when important developments, political, commercial, and probably diplomatic, are in prospect.

ATENTION was called last week by our Mexican correspondent to the placing of the order for a notable hydraulic excavation plant by the Government with Henry R. Worthington, of New York. The significant point is that the order went to New York. Government engineers in charge of work on the Panama Canal visited California to inspect hydraulic mining methods; they perceived the possibility of adapting similar methods to excavation on a portion of the Canal prism; such adaptations had long been made in the West for removing dirt to construct earth-dams, and lately large areas of hill-ground in Seattle were levelled by these means. Western engineers and manufacturers had co-operated for decades in developing hydraulic mining appliances, and the world has drawn its models from the practice worked out chiefly through Californian experience. But when it came to placing an order the Government perforce bought in the cheapest market. This is said in no spirit of local interest; it is instructive through the light which it sheds upon the difference between commercial conditions on the Atlantic and Pacific coasts. The basal industries in the East are more cheaply conducted, and the Western industry has grown to a large extent through taking part of the trans-continental freight rate as local manufacturer's profit. The Pacific Coast has no iron furnaces, no steel-making plants, no copper refineries; it is not yet able to compete with the Easterner nor the foreigner. But it possesses the raw materials; there is no lack of iron ore, though much of it has been bought and held for the future by Eastern and Middle-West corporations; there is available copper, coal, oil, and cheap hydro-electric power. The elements are here, and if California means to reach over-

sea in commercial conquest it behooves her people to seriously develop the fundamental industries on which alone a great trade can be built.

THE resolutions of the American Mining Congress, which we published last week, will repay careful reading. They represent the sifted and condensed opinion of the thoughtful members and delegates who met at Goldfield. Collectively, they constitute the program and platform of that organization for the next year. The breadth and conservative character of the resolutions is striking. Amendment of the mining law, creation of a Bureau of Mines, establishment of additional assay offices, approval of conservation, better legislation for the Alaska coalfields, aid to the merchant marine, and other equally important subjects are treated. A marked feature of the present plan of work is the creation of committees to study and report on various subjects, such as the relations of the Forest Service to mining claims, the possible larger use of silver, the prevention of mine accidents, etc. All this denotes growth from the time when the most inspiring speeches related to the next place of meeting and the election of directors. It indicates a welcome indisposition to act before study, and seems likely to result in resolutions which will stand criticism. Nothing truer was said at Goldfield than the remark of Mr. J. H. Richards, in the course of his presidential address, that the influence of the Congress depends upon the honesty and intelligence of its members. The new president, Mr. E. R. Buckley, is a mining geologist of distinction who has served faithfully as vice-president and is thoroughly informed and in harmony with the best ideals of the organization. Everything points to continued growth in influence and power of the American Mining Congress.

Mine Inspection Again.

Mine inspection is a subject which is just now attracting considerable attention. In California last winter a proposed system of inspection was defeated. In Arizona an excellent commission has been appointed, with Mr. Will L. Clark as chairman, to draft a mining code and submit it to the next session of the Territorial Legislature. This commission has already prepared a first draft and it is now being submitted for amendment to experienced critics both within and without the Territory.

In Illinois a similar commission has been constituted, and it is, perhaps, expressive of the larger view which is coming to be common, that the body includes representatives of the miners' and operators' organizations, of the mine inspection service, of the State University and of the Technological Branch of the United States Geological Survey. A commission including Mr. John Walker, Mr. G. W. Traer, Mr. Richard Newsam, Mr. H. H. Stock, and Mr. J. A. Holmes, to name only a few of its members, shows no lack of talent. This action of the General Assembly of Illinois, in handing a technical subject over to a competent commission for advice, is in striking contrast with the defeat by the United States Congress of the bill for a Tariff Commission.

In the meantime the mine inspectors themselves

are not idle. Their new and excellent organization, the Mine Inspectors' Institute of America, has appointed a committee to collect the mining laws of the various States as a first step toward a common code, if that prove feasible in whole or in part. They have wisely decided that the laws of foreign as well as American States should be taken into account, and at their request Mr. J. W. Paul, of the Technological Branch of the United States Geological Survey, himself formerly chief inspector of West Virginia, is now collecting and codifying the laws relating to inspection in coal mines. This is a most useful work; one sure to result in much benefit. We regret that there seems to be no legal authority for the Geological Survey to undertake a similar compilation of inspection laws as they relate to metal mines. Since, however, during this Administration all acts are to be "well buttressed by law" we can only hope that Congress will give the specific authority to some proper branch of the Government service this winter. The need of greater uniformity in the State inspection laws is urgent, and a general report on the subject by an impartial Federal authority, with possibly a model law for Alaska and the Territories, would, we believe, prove as stimulating to correct local legislation as did the National Pure Food Law.

Genesis of Petroleum.

The subject of the origin of oil and related natural hydro-carbons has attracted much attention in recent years. A distinct reaction against the time-honored theory which attributed their derivation to the decay of organic matter buried in the course of laying down the sedimentary rocks has occurred. To Mr. Eugene Coste's vigorous, almost polemic, writing is mainly due the renewed interest in the long dormant theory of the inorganic origin of petroleum. Mr. Coste has raked the records for all facts bearing against the organic hypothesis and favorable to the inorganic. If it be objected that his citations have not always been well chosen, and in fact have been so used as to obscure and sometimes distort the description of the original authors, it may at least be said that he has brought together a startling array of instances of the association of petroleum with igneous rocks. He has lately received support from an unexpected source. Mr. G. F. Becker has attacked the problem with his usual acumen, and, while he cautiously refuses to commit himself concerning the relative quantitative importance of the organic and inorganically derived petroleums, he evidently considers the latter to be worthy of much larger recognition than they so far have received. We believe that Mr. Becker's major contribution to the subject consists in pointing out the possibility, or probability, if you wish, of the derivation of hydro-carbon compounds through the action upon terrestrial iron of ammonium chloride, such as is given off by volcanoes. The details of Mr. George Steiger's experiments, made for Mr. Becker, are promised later, and will be read with much interest. As a result of this work we are no longer restricted to the action of water on natural carbides if we seek an inorganic origin for

oil. Mr. Becker's second point, that there is a coincidence between the occurrence of petroleum and magnetic disturbances, does not seem to us so well taken. The economic importance of such a relation, if it exist, is obvious. Its explanation would doubtless lie, as he suggests, in the relation of both to masses of minerals or rocks possessing sensible magnetic attraction. We are not, however, impressed with the coincidences, at least as shown by the map which Mr. Becker has published. We find it particularly difficult to see the "strong deflections of the isogonal lines" which "accompany the chain of hydro-carbon deposits" in California, and to us the rule seems poorly sustained in the other great oil-fields lying in Oklahoma and Illinois. In the coastal plain area of Louisiana and Texas, again, the lines, as shown on the map, do not seem to conform to the theory. We understand that detailed observations in certain Louisiana districts do show the required coincidence between local magnetic attraction and the occurrence of oil, but in our own experience perhaps equally striking coincidences between local attraction and local illiteracy have been observed in southern Indiana. This is not said in any jesting spirit, but to emphasize the fact that argument based on coincidence needs many and striking examples to give it weight, and, in our judgment, that is exactly what is lacking in the present case. Hence the conclusion that "Henceforth no geological theory of petroleum will be acceptable which does not explain this association" is not fully substantiated. Mr. Becker has conferred a benefit in calling attention to the possibilities and in offering a reasonable hypothesis to account for them. It is worth perhaps what it will undoubtedly cost in the assistance it will give the sharpeners who trade on the ignorant in the locating of oil wells; but it is well not to overestimate the validity of a new hypothesis.

As to the main question of the origin of petroleum, there is much yet to be said on both sides, and for the present it seems well not to be too ready to release the old and grasp the new. The argument for organic origin rests on a well ascertained body of fact, both experimental and observational. The theory accounts for the fact that all large pools so far discovered are in sedimentary rocks, and reasonably near possible sources of organic origin. It offers also an explanation for the association of petroleum with rocks of a particular age in each geologic province; such as the Trentonian rocks of Ohio, Indiana, and neighboring States, the Mississippian and early Pennsylvanian beds of Ohio, Indiana, Illinois, Kansas, and Oklahoma, and the Miocene in California. This association is close and well established, and finds a ready explanation in paleogeography. To the objection that decay of organic matter produces methane alone, it is needful only to call attention to the action of putrefying bacteria. Thanks to the excellent work of Mr. David White, these have been shown to be present even in the identical oil-bearing shale near the base of the Trenton, which is a not improbable source of the Trenton oil. The whole subject demands additional study, and in the meantime our enthusiastic friends must pardon us if we counsel them to make haste a bit slowly.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. F. STEVENS was in San Francisco.
R. F. GIBSON has taken an office in Los Angeles.
EDWIN J. COLLINS, of Duluth, is at Globe, Arizona.
GEORGE OTIS SMITH was in San Francisco this week.
E. F. BURCHARD has been at Bismarck, North Dakota.
C. V. CRAIG has gone to Guadalupe, Zacatecas, Mexico.
E. C. KNOWLES, of Deadwood, S. D., is in San Francisco.
E. D. LIDSTONE, of Cordova, Alaska, is in San Francisco.
D. G. DAVIES has gone from Spokane to Joseph, Oregon.
FORBES RICKARD is examining mines at Rhyolite, Nevada.
BOND COLEMAN has gone from Miami to Kelvin, Arizona.
W. O. CROSBY has been at Oroville and is in San Francisco.
J. D. WINTON has returned to San Francisco from Nome, Alaska.

HUXLEY ST. J. BROOKS is in Costa Rica on professional business.

V. P. STRANGE has returned from Missoula, Montana, to Salt Lake.

WALTER F. LAWRY, of Sydney, Australia, passed through San Francisco.

W. E. DEFTY is engaged in making examinations in Pinal county, Arizona.

C. HENRY THOMPSON has returned to Los Angeles from Durango, Mexico.

A. W. SCOTT, of the Scott Mines Co., has returned to Salt Lake from Alaska.

JAMES P. GRAVES, president of the Bingham Mines Co., was at Salt Lake last week.

FRANK McHALE has opened a technical book-shop at 26 Cortland St., New York.

ROBERT R. HEDLEY has removed from Sudbury, Ontario, to Nelson, British Columbia.

LANE C. GILLIAM has returned to Seattle from Alaska. He will go to Los Angeles, November 1.

ARTHUR H. LAWRY has sailed for Nicaragua. He becomes assistant to C. S. Herzig at La Libertad.

F. H. MASON, after a long sojourn at Paso Robles for his health, has improved, and has gone to San Diego, California.

C. L. CONSTANT, JR., is making an extended professional visit to the mining sections of Ontario and eastern Canada.

LLEWELLYN HUMPHREYS, consulting engineer for the Gunn-Thompson Co., was recently at Yerington, Nevada, and San Francisco.

U. S. GRANT and a party of students from Northwestern University have been visiting the Wisconsin-Illinois lead and zinc fields.

WERNER ZIEGLER, formerly with the Ohio Copper Co., of Utah, is superintendent of the Sunbeam mine and mill, Custer county, Idaho.

J. H. WINWOOD and H. L. CHAMBERLIN, of Salt Lake, will be engaged the next month on Government land surveys in Washington county, Utah.

JOHN R. FREEMAN and A. P. DAVIS have been visiting Oroville and have gone to La Grange. They will later visit the Los Angeles Aqueduct.

L. VOGELSTEIN & Co. send the following figures of German consumption of foreign copper for the months January to August 1909:

| | Tons. |
|------------------------|---------|
| Imports of copper..... | 109,334 |
| Exports of copper..... | 5,289 |

Consumption of copper..... 104,045

as compared with consumption during the same period in 1908 of 101,945 tons. Of the above quantity 100,192 tons were imported from the United States.

Latest Market Reports.

LOCAL METAL PRICES.

San Francisco, October 20.

| | | | |
|--------------------------|------------|--------------------------|---------|
| Antimony..... | 12-12½c | Quicksilver (flask)..... | 46½-47½ |
| Electrolytic Copper..... | 15¼-16¼c | Spelter..... | 7-7¾c |
| Pig Lead..... | 4.65-5.60c | Tin..... | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver. |
|--------------|----------------------|------------|----------|---------|
| Oct. 15..... | 12.69 | 4.34 | 6.13 | 50¾ |
| " 16..... | 12.69 | 4.34 | 6.18 | 50¾ |
| " 17..... | Sunday. | No market. | | |
| " 18..... | 12.69 | 4.34 | 6.20 | 50¾ |
| " 19..... | 12.69 | 4.34 | 6.28 | 51 |
| " 20..... | 12.69 | 4.34 | 6.33 | 51 |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Oct. 14. | Oct. 20. |
|------------------------|----------------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 9 6 | 1 7 9 |
| El Oro..... | 1 5 7½ | 1 5 7½ |
| Esperanza..... | 2 17 0 ex div. | 2 17 6 |
| Dolores..... | 1 5 0 | 1 10 0 |
| Oroville Dredging..... | 0 13 6 | 0 11 3 |
| Mexico Mines..... | 6 13 9 | 6 13 9 |
| Tomboy..... | 0 19 4½ | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. | Closing prices. |
|---------------------------|-----------------|
| October 20. | October 20. |
| Amalgamated Copper..... | 83½ |
| A. S. & R. Co..... | 97½ |
| Boston Copper..... | 14 |
| B. C. Copper Co..... | 6½ |
| Butte Coalition..... | 26½ |
| Cumberland-Ely..... | 7½ |
| Davis-Daly..... | 5½ |
| Dolores..... | 7 |
| El Rayo..... | 2½ |
| Ely Central..... | 2 |
| First National..... | 5½ |
| Giroux..... | 8¾ |
| Guanajuato Con..... | 2½ |
| Inspiration..... | 6¾ |
| Kerr Lake..... | 8¾ |
| La Rose..... | 6½ |
| Mason Valley..... | 17½ |
| Miami Copper..... | 15½ |
| Mines Co. of America..... | 4½ |
| Montgomery Shoshone..... | 1½ |
| Nevada Con..... | 24½ |
| Nevada Utah..... | 1½ |
| Nipissing..... | 11½ |
| Ohio Copper..... | 4½ |
| Ray Central..... | 2½ |
| Ray Con..... | 18½ |
| Tuolumne Copper..... | 4½ |
| United Copper..... | 9½ |
| Utah Copper..... | 48½ |
| Yukon Gold..... | 5½ |

COPPER SHARES—BOSTON.

| Closing Prices. | Closing Prices. |
|---------------------------|-----------------|
| October 20. | October 20. |
| Adventure..... | 5 |
| Allouez..... | 57 |
| Atlantic..... | 10½ |
| Calumet & Arizona..... | 98 |
| Calumet & Hecla..... | 660 |
| Centennial..... | 57 |
| Copper Range..... | 80 |
| Daly-West..... | 7½ |
| Franklin..... | 16½ |
| Granby..... | 76½ |
| Greene-Canaan, etc..... | 10½ |
| Isle Royale..... | 24½ |
| La Salle..... | 14½ |
| Mass..... | 6 |
| Mohawk..... | 58½ |
| North Butte..... | 58 |
| Old Dominion..... | 51 |
| Osceola..... | 166 |
| Parrot..... | 30 |
| Santa Fe..... | 17½ |
| Shannon..... | 152½ |
| Superior & Pittsburg..... | 15½ |
| Tamarack..... | 65 |
| Trinity..... | 10½ |
| Utah Con..... | 43½ |
| Victoria..... | 3½ |
| Winona..... | 6½ |
| Wolverine..... | 150 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 20.

| | | | |
|---------------------------|------|----------------------------|-------|
| Atlanta..... | 8 12 | Midway..... | \$ 16 |
| Belmont..... | 74 | Montana Tonopah..... | 86 |
| Booth..... | 12 | Nevada Hills..... | 70 |
| Columbia Mtn..... | 7 | Ophir (Comstock)..... | 2 00 |
| Combination Fraction..... | 62 | Pittsburg Silver Peak..... | 60 |
| Daisy..... | 9 | Rawhide Coalition..... | 21 |
| Florence..... | 2.90 | Rawhide Queen..... | 24 |
| Goldfield Con..... | 6.97 | Round Mountain..... | 64 |
| Gold Keweenaw..... | 5 | Sandstorm..... | 5 |
| Great Bend..... | 5 | Silver Pick..... | 11 |
| Jim Butler..... | 13 | St. Ives..... | 10 |
| Jumbo Extension..... | 14 | Tonopah Extension..... | 55 |
| MacNamara..... | 29 | Tonopah of Nevada..... | 7.00 |
| Mayflower..... | 13 | West End..... | 25 |

R. B. LAMB, of the C. L. Constant Co., is leaving New York on a prolonged professional tour of the Western mining sections.

The SAN FRANCISCO SECTION of the Mining & Metallurgical Society of America held a meeting preceded by dinner in the Fish Room of the Bismarck Cafe, Friday, October 22.

General Mining News.

ARIZONA.

COCHISE COUNTY.

The shaft of the Empire Copper Co., at Dragoon, is down 90 ft. A body of malachite ore has been recently opened and it is understood that the company will install a compressor and hoist.—The shaft of the Keystone, at Johnson, is down 40 ft. Some black oxide ore was crossed by the incline.—The Arizona Shipping Mines Co. has taken over the Neale claims and is preparing to sink a shaft on the property.—The smelter of the Arizona United Mining Co., at Johnson, which was blown-in recently, is making matte that runs 55% copper. The shaft is down 750 ft., and a large body of low-grade copper is blocked out.—The California & Paradise Mining Co. was organized in Bisbee to take over the Leadville property in the Paradise district. W. V. Richards, of Bisbee, will be in charge of the work.—The adit on the Sunflower claim of the Duncan group, at Paradise, cut a body of copper ore when in 425 ft. The vertical depth is about 125 ft.—About 1 ft. of the ore in the 4-ft. vein opened by the cross-cut from the shaft on the Doran & Gallagher property is of shipping grade. On a lot sent to the El Paso smelter the assay was 31% zinc, 21% lead, 20% sulphur, 3% iron, with 8 oz. silver.

GILA COUNTY.

The grading for the concentrator of the Miami Copper Co. has been completed and the construction of the foundations for the first unit of the plant is well under way. A new double drum hoist is being installed at the No. 4 shaft, and a 1000-ton pocket cut at the 420-ft. level. The company put on sale a number of lots in its townsite and it is estimated that \$50,000 worth of property changed hands the first day of the sale.—The smelter of the Arizona Commercial Copper Co., near Globe, was blown-in about the middle of the month. It has a capacity of 500 tons per day, and the company has a large supply of different fluxes on hand so it can treat any class of commercial ore that may be shipped to it. Most of the ore on hand has been taken from the Eureka shaft, which has now been drained below the seventh level. Drifts have been started in the orebody.—Three machine-drills have been added to the equipment of the National Mining Exploration Co., at Globe, and the company plans to double the capacity of its steam plant in the near future. The Williams shaft is down 250 ft. in a diabase that contains considerable iron. The shaft will be continued to the 500-ft. level before any lateral work is done.—At the Live Oak property the company is confining the work to development on the 200 and 300-ft. levels. The management estimates that there is 500,000 tons of ore opened that will average 2½% copper. M. E. McCarthy is manager.

MOHAVE COUNTY.

Denver capitalists have secured a bond on the Witherlay property, 12 miles east of Planet, and will sink a 500-ft. shaft. John Witherlay, the owner of the property, has taken a bond on the Concho group in the White Picacho district.—The Nevada-Arizona Mines Co. has commenced grading for a 60-ton mill at its mine east of Hackberry. Two shafts have been sunk opening the vein to a depth of 250 ft., and an adit started that will give 500 ft. of backs. The vein is 8 ft. wide and the ore free-milling. T. J. Grant is superintendent.—Newton Evans and associates, of Los Angeles, have purchased the railroad that the Mohave Gold Mining Co. built several years ago, and will tear up the rails and build a spur from the Swansea road to the McCracken mine.—At the Horseshoe mine, near Cerbat, the shaft is down 275 ft. A station will be cut at the 350-ft. level and a cross-cut run to the vein.—The Arizona Gold Mines Co. is having its property east of Kingman surveyed for patent. The claims include the Bi-Metallic group.—One carload per day of 47% zinc ore is being shipped from the Golconda mine in the Cerbat district. An adit is to be started shortly that will intersect the vein at a depth of 350 ft.—The suit of the old Blue Ridge stockholders

against the Tom Reed property has been settled and the Hammond interests are to take over the property.

YAVAPAI COUNTY.

Two new dredges are to be built on Lynx creek in the Big Bug district by the Speck Mining Co., and the Prescott Dredge Mining Co., the design and construction of the machines being in the hands of the Snyder Iron & Steel Co., of Kansas City. M. L. Buckley is manager of both properties.—A carload of cobalt and nickel ore from the Red Bluff group, six miles east of Dewey, has been shipped to the reduction works at Perth Amboy. T. C. Jordan, the manager of the property, will visit the plant to determine the most advantageous method of handling the ore.—The mill of the Mount Elliot Consolidated Mining Co., near Big Bug, has been started and ore is being drawn from the 530-ft. level of the mine.—The shaft of the Pick & Drill mine has been re-timbered and work started on the vein at the 250-ft. level. S. J. Gnash is manager.—Thomas McSherry is opening a 4-ft. vein on his property in the Santa Maria district, 18 miles northwest of Hillside, that assays from \$16 to \$100 per ton.—The cyanide plant at the Alaska mine, in the Congress district, will be completed this month, and will be put in operation at once. D. J. Sullivan is manager.

YUMA COUNTY.

F. A. Crampton has been appointed manager of the Arizona Copper Belt Co.'s mines in the Black Rock district, and work will be resumed on the construction of the mill being erected on the property.—The Vulcan No. 2 shaft, of the Daly Mines Co., operating near Bouse, is down 40 ft., and has opened several bunches of carbonate ore. The shaft is being sunk on a limestone contact.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—A 19-ft. body of milling ore has been cut on the 1700-ft. level of the Bunker Hill. A drift will be run from the 1900-ft. level to cut the vein, and if it proves satisfactory 20 stamps will be added to the 20-stamp mill. September 15 the company paid its 37th consecutive monthly dividend, and increased the rate from 5 to 6c. per share.—Rapid progress at the South Eureka is being made with grading and construction for the new 20-stamp battery.—The Defender has greatly curtailed operations and suspended all work at the recently completed cyanide plant. It is reported that the methods of treatment were not adapted to the ores.—Litigation between the former and present owners of the mines controlled by the California Consolidated Mines Co., has been started, and the case will shortly come up for trial in the Superior Court. The former owners claim that the California Consolidated Co. agreed to discharge certain liabilities against the company, but have failed to do so. The company controls the Wildman, Mahoney, Keystone, and other properties near Jackson. No work has been performed at the Wildman or Mahoney for several months. At the Keystone operations were recently resumed after several months' idleness.—The Kennedy is producing steadily and sinking the shaft below the 3500-ft. point.—The Kennedy Extension is repairing the old shaft and preparing for active work.

Jackson, October 18.

PLUMAS COUNTY.

(Special Correspondence).—An asbestos claim has been located by local men near the Spring Garden tunnel of the Western Pacific railway, and development has been started.—It is reported here that the Plumas Mohawk has passed into the hands of strong Eastern interests, and work on a largely increased scale will be commenced shortly.—The Northern California Mining & Development Co. has started work on several placer and quartz properties in the Quincy district.—The copper deposits, near Beckwith, are receiving considerable attention. Several promising claims are being prospected and good-grade ore opened.—San Francisco people have taken over the Gunsner property, on the north fork of the Feather river. Owing to its distance from transportation points developments have been restricted. It is reported that a steam shovel or light dredge

will be installed.—Nevada mining men are opening numerous properties in the Genessee district. The ores carry copper and gold.

Quincy, October 18.

SHASTA COUNTY.

The new span in the bridge of the Sacramento Valley & Eastern Railroad Co., across the Sacramento river above its junction with the Pit, has been completed. This road handles the supplies of the Bully Hill Mining Co., at De La Mar and Copper City, so the work was hurried to complete the span before the high-water season.—The Bullychoop mine, in the Bullychoop mountains, west of Redding, has resumed operations. The ore at the Bullychoop is base and the tailing contains much of the precious metal in spite of the efforts of the company to make a complete saving. There is a 30-stamp mill on the property which is managed by G. E. Beck.

SIERRA COUNTY.

The South Fork adit at Forrest cut a vein supposed to be the extension of the famous Tightner vein. Fred W. Kuhfeld is superintendent.—The English company that is operating the Bunker Hill and Four Hills groups under bond is negotiating for the Phoenix mine near Sierra City. The Phoenix is equipped with a first-class surface plant and has been started several times lately, but has been closed on account of poor financial condition of the operators.

TRINITY COUNTY.

The tunnel of the Trinity River Tunnel Mining Co., near Lewiston, has been completed and four turbines set in place at the power house. The tunnel has a capacity of 26,000 miners' inches of water, and with the machinery has cost the company approximately \$125,000. It is 1350 ft. long and drains one mile of the channel. The gravel will be washed from the bedrock by hydraulic giants and raised to the sluice boxes by hydraulic elevators and electric shovels.—The company operating the Headlight mine, near Trinity Center is planning to erect a mill at the property in the spring. There is a large body of low-grade ore in the mine that has been considerably prospected.

COLORADO.

GILPIN COUNTY.

At the Iroquois property, in the lower Russell district, the vein has been opened on the 80, 220, and 320-ft. levels, the ore averaging about \$18 per ton. On the recent excellent showing in the mine the company is preparing to install a power plant and machine-drills.—Rooney & Co., operating the Forks mine, on Quartz hill, under lease, have been forced to abandon the lower levels temporarily on account of the heavy flow of water, and are working on a small vein of lead ore on the 200-ft. level.—The return on a shipment of ore from the Hall mine, in the Russell district, to the Modern smelter, was satisfactory and the company is preparing to ship regularly.—Pool & Co., operating the West Notaway mine, have commenced shipping copper ore from the 400-ft. level.—The Cashier Gold Mining & Reduction Co. has installed an 80-hp. boiler at its property, near Russell, and is shipping the high-grade smelting ore. William Auger is manager.

GUNNISON COUNTY.

Ruben Jones has secured the Revenue mine, at Ohio City, and will equip the property with a complete surface plant.—G. M. Lyons, secretary of the Grand Prize Mining Co., at Ohio City, has purchased the Mono and Chloride groups of claims and will drive a long adit from Jones gulch to prospect the properties.

LAKE COUNTY.

Green Brothers, leasing the Little Ellen mine near Leadville, opened an orebody that assays \$60 per ton on the contact that crosses the property.—At the Wall Street in the same district the shaft is down 350 ft., and the company is to install a heavier hoist and sink to the 500-ft. level.—At a meeting of the directors of the New Monarch Mining Co. it was decided to purchase a new hoist and sink to the 1000-ft. level. A drift is being run from the Yak tunnel to drain the property.

OURAY COUNTY.

John Kelecher, operating the Neodesha mine under lease, shipped two cars of high-grade silver ore.—The ore recently opened on the 100-ft. level at the San Antonio mine, near Red mountain, assays from 50 to 100 oz. silver per ton with a fair copper content. John F. Roper is manager.—The plans for the smelter of the Mono-Baltic smelter, at Ironton, have been drawn and four carloads of machinery shipped to the property.

TELLER COUNTY.

A rich discovery was made at the Victor mine by the Roscoe Leasing Co. A raise from the old drift opened a shoot that assayed over \$40 per ton. Frank Roscoe is manager.—The old workings of the Damon mine, on Iron-clad hill, have been re-timbered and the lessees will commence shipping at an early date.—Lessees of the old dump at the El Paso reduction works are treating the accumulated tailing at an approximate profit of \$2 per ton.—The Portland Gold Mining Co., paid a dividend of 2c. per share on October 15, the total amounting to \$50,000. The mill buildings are being re-modeled and the company expects to have the new machinery running before the end of the year.—Lessees at the New Boston mine, on Womack hill, commenced shipping with a 25-ton lot consigned to one of the Cripple Creek plants.—Thirty tons of ore were shipped from the Prince Albert mine by M. Williams.—The Altman Leasing Co. has sunk the Pinto shaft on Bull hill to the 800-ft. level, and is cutting a station at that point. One of the conditions under which this company secured the lease on the property was that the shaft be sunk to this level before any lateral work was started. Edward Carpender, leasing on the surface of the property, has opened a shoot of rich smelting ore near the Ida Belle claim.—The raise at the Happy Year mine cut a vein that assays from \$60 to \$100 per ton. The company is shipping five cars of milling ore per week and will now commence shipping smelting ore. A. B. Whitmore is superintendent.—The September output of the Vindicator Consolidated Gold Mining Co. amounted to 3000 tons approximating \$90,000 in value.

IDAHO.

NEZ PERCE COUNTY.

A company headed by J. S. Irvin, of Ottawa, managing director of the International Portland Cement Co., and head of the Exshaw Portland Cement Co., of Alberta, has been organized to erect a cement plant near Orofino, where it has just acquired 223 acres of clay and lime beds, known as the J. M. Bartlett tract. The plant which will cover 12 acres, involves an initial expenditure of \$1,500,000, and will turn out 2500 barrels of cement per day. C. A. Reid, of Spokane, will be manager.

SHOSHONE COUNTY.

The Alice Mining Co. has started its mill between Wallace and Burke. There is sufficient ore blocked out in the mine to keep the 100-ton plant in operation at full capacity for several years. The company owns 24 claims which are being developed under the direction of James F. McCarthy, manager of the Hecla Mining Co. Though the property was located in early days the rich orebodies were opened only two years ago.—Maurice Blanchard, who has charge of the construction of the 25-ton smelter at Enaville, announces that the plant will be in operation early in November. It is designed to treat lead-silver ores, and cost approximately \$2000 to build. The furnace is of 90% silica brick designed to withstand a heat of 4000°.—Samples taken from the shoot recently cut at the Rainbow property, near Wallace, assayed 29% copper and 57 oz. silver per ton. The drift is now in 770 ft.—The Hamilton & Coeur d'Alene Mining Co. has been organized by Richard Dixon, manager for the Tarbox Mining Co., to open several claims adjacent to the Iron Mask mine, in Spring gulch. An 18-in. vein of galena has been found on the property.—The adit of the Gold Cliff Mining Co., near Murray, cut an 8-in. vein, samples from which assayed over \$20 per ton.—The Star Mining Co., operating between Wallace and Burke, is arranging to erect a concentrator at its property. The tax levied by Shoshone county on the valua-

tion and profits of producing mines in that part of the Coeur d'Alene district is 0.3c. on the dollar. The completed roll, prepared by the assessor, gives these statistics: The Bunker Hill & Sullivan, \$290,396.75 worth of property, including patented mining claims, machinery, and improvements, with net profits, \$901,701.50; the Coeur d'Alene Mining Co., \$28,415.50; the Federal Mining & Smelting Co., \$404,975.25 on its properties, and will pay taxes on net profits as follows: Mullan properties, \$16,855; Mace properties, \$693,124; and Wardner properties, \$221,609; the Helena-Frisco, \$25,867; Golden Chest, \$11,065; Gold Hunter, \$27,835; Hecla, assessed, \$72,708; taxed on net profits, \$108,798.81; Hercules, assessed, \$115,715; taxed on net profits, \$383,751.89; Pittsburg Lead, \$14,615; Snowstorm, assessed, \$60,565; taxed on net profits, \$162,148.56; Success, \$22,200. That the Idaho Northern Railway Co. is preparing to extend its line into the heart of the north side of the Coeur d'Alene is confirmed in an announcement by E. P. Spaulding, of Spokane, vice-president and general manager for the company. The permanent survey for the branch up the little North Fork has been approved, and it is given out that construction work on this extension will be commenced within a short time. This branch will afford quicker and more economical transportation to the mining districts and will tap a large timber belt.

MICHIGAN.

The excavating has been completed for the new engine and compressor house, and the concrete foundations for the new plant at the Hancock Consolidated finished. A new Sullivan 34 by 72 in. direct-connected Corliss hoisting engine, with a 15 by 15-ft. drum, hoisting an 8-ton skip 3500 ft. per minute from a depth of 4000 ft. will be installed. The compressor house will contain a 13-drill, a 16-drill, and a new tandem compound steam and air Corliss 20-drill compressor. The engine and compressor house will be of steel, fitted with a traveling crane. The boiler house will also be of steel, and will house two batteries of four boilers each. The smokestack will be built of reinforced concrete, by the Webber Chimney Co., of Chicago, and will have an inside diameter of 90 in., and be 130 ft. from the ground having a 12-ft. base.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The Prince Consolidated Mining Co., controlled by James L. Hackett and A. H. and E. L. Godbe, is shipping four cars per month from the Prince mine, at Pioche, which assays approximately 85 oz. silver, 32% lead, and \$6 gold per ton. The mine, which is opened by a 600-ft. shaft, has about two miles of development. Besides the ore of shipping grade, there are large reserves of milling ore, running 15 oz. silver and \$3 gold per ton, with 10% lead, 12% iron, and 56% silica. The silver occurs as chloride, the lead is a carbonate, and the iron an oxide and carbonate. Tests are being made at Salt Lake by the General Engineering Co. to determine the methods and equipment required for the new mill which is to be erected within the next few months. The plant will have a capacity of 100 tons per day, and be a combination of concentration and cyanidation. It will provide for wet-crushing, screen classification, jigging, and concentration on James tables, the table tailing to be re-ground in a tube-mill. All the wet-crushing, jigging, concentration, and re-grinding will be done in cyanide solution. It is assumed that most of the lead and some of the silver will be recovered by the jigs and tables. The re-ground product of the tube-mill is to pass to agitation and decantation tanks for further cyanidation to extract the silver and gold. The decanted gold and silver solution will then go to zinc boxes for precipitation. It is thought gasoline engines will serve for power, using distillate that costs in Pioche 17c. per gallon.—The Nevada-Utah Mines & Smelters Corporation, controlled by Hooley, Learnard & Co., of New York, owns the Raymond-Ely, Meadow Valley, Half Moon, Day, and Manhattan-Highland properties in the Pioche district. The Day is the most active of these. On it development to the amount of 1000 ft. per month is being made, consisting of drifts and cross-cuts from levels above the 900-ft. station.

The ore runs high in iron and manganese, has a limestone gangue, and only 1 or 2% silica, making a fluxing ore in demand at the smelting plants. Prior to the closing of the Tintic smelter 150 tons per day were shipped to that plant. The shippers obtained a freight rate of \$1.75 per ton on this fluxing ore from Pioche to Tintic, on ore that ran not over \$5 per ton in silver and lead; they were paid \$3.50 per ton for the iron and lime, which raised the grade to about \$9 per ton. An effort is now being made to make a satisfactory contract with other smelting companies. J. P. Gaskill, Western manager for the company, states that there are 10,000 tons of ore broken and ready to ship. The company usually employs a force of 75 men.

Pioche, October 16.

LYON COUNTY.

(Special Correspondence).—Llewellyn Humphreys, consulting engineer for the Mason Valley Mines Co., recently visited the company's mine at Yerington. He states that the branch railroad, under construction from Wabuska station to the Yerington district, will be ready to serve the Mason Valley mine by December. He says there is no doubt that a smelting plant will be erected in that district; and it is possible that parties interested in the Mason Valley, Nevada-Douglas, and other properties there may co-operate in building a plant to smelt their ores. The Mason Valley and Nevada-Douglas are well developed and both produce ore of smelting grade. The Bluestone also has a large tonnage of ore blocked out, but its ore is mostly of a grade that will require concentrating before smelting. Chas. A. Weck, manager of this property, has made many important tests in an experimental mill.

Yerington, October 16.

NEW MEXICO.

NAVAJO COUNTY.

A group of 16 business men from Prescott has filed on 1440 acres of coal land in the southern part of the county. A company will be formed to open the property, which is supposed to be an extension of the beds found near Gallup. Several previous attempts have been made to work the coal beds of this county, but the extreme distance from transportation made it unprofitable.

TEXAS.

BREWSTER COUNTY.

A company, headed by C. C. Lewis, of San Antonio, has made arrangements to operate the Brogas silver mine in the Davis mountains on a large scale.

EL PASO COUNTY.

(Special Correspondence).—F. W. Thomme, of Round Top, New Mexico, who owns the Sierra Blanca copper mine, in the Devil Ridge mountains near Sierra Blanca, is arranging to resume operations on the property. He expects to begin shipping ore soon.—The Black Kettle Copper Co., composed of Baltimore men, have started extensive development upon its mine, which is situated in the Quitman mountains south of Sierra Blanca. John N. Gilcrease, of Sierra Blanca, recently shipped his sixth car of copper ore from his mine in the Thunder Bird district, 75 miles east of El Paso. The ore is chalcopryite and the shipments so far have averaged 18% copper. The orebody occurs in crystalline limestone overlaid by granite porphyry, at the base of the Quitman mountains. At a recent meeting of the board of directors of the Republic Mining & Milling Co., held at Dallas, it was voted to resume development at the company's zinc mine in the Quitman mountains. The company has a mill and concentrating plant on the property which is called the Bonanza.

El Paso, October 15.

UTAH.

CARBON COUNTY.

The Utah Fuel Co. is beginning an 8300-ft. tunnel to be used as a conduit for a water supply for the town of Sunnyside. J. H. Winwood made the survey for the work.

PIUTE COUNTY.

(Special Correspondence).—The Sevier mine, which practically adjoins the Annie Laurie at Kimberly, is now the property of the Salt Lake Hardware Co., whose intention is

to open the mine to a greater depth, re-model the mill, and operate both next season. W. C. Marshall, of Salt Lake, the consulting engineer for the owners, states that there are seven veins on the property, and that two are on contacts of monzonite and andesite-breccia, two others in dacite, and the rest in andesite. The first two are 45 ft. apart, each having an east dip to a depth of 85 ft., where the dip changes to the west. It is on these that the greatest development has been done. The veins vary in width from 4 to 15 ft. The gangue consists of quartz, fluorspar, and calcite, carrying gold and silver from \$6 to \$8 per ton. The silver is in the ratio of 2 to 1 to the gold. It is partly free and partly associated with tellurium, occurring as calaverite and petzite. Some of the silver occurs as chloride and bromide. The intention is to equip the mill for cyaniding in agitation tanks, preceded by an acid treatment. The mine, which has 8000 ft. of development, has been opened to a depth of 300 ft. by adits. On the property is a steam-electric plant, but this will probably be supplanted by a hydro-electric plant on Clear creek, the work of installing which was partly done some time ago.

Kimberly, October 16.

SALT LAKE COUNTY.

(Special Correspondence).—The Wasatch-Utah Gold Mining Co. has over 12,000 ft. of development on its property at the mouth of Little Cottonwood canyon, the main openings consisting of a 315-ft. shaft and a 1400-ft. drain tunnel that connects with the shaft at the 270-ft. station. The property has a fissure vein in diorite, a high-grade streak of the ore assaying 6 to 10% copper, and 3 to 8 oz. gold per ton. This streak is 3 to 8 in. wide in a vein that contains large tonnage of highly silicious gold ore, some of which is being shipped to one of the Salt Lake smelters for use as converter lining. E. E. Price, formerly at the Yampa mine, is superintendent, and A. W. Nieman, of Chicago, manager. Sandy, on the San Pedro railroad, is the nearest shipping station.—The New England Gold & Copper Co., on Carr Fork, Bingham district, is shipping four cars per month of high-grade ore and concentrate, carrying gold, silver, lead, and copper, assaying \$30 to \$40 per ton. The property is in charge of D. J. Cook.—The Bingham & New Haven Mining Co. has its new mill in operation, handling 80 to 100 tons of ore per day. The ore is a sulphide of iron, copper, and lead, accompanied by some gold and silver; the gangue consists of silica and limestone. The mill is equipped with a Blake crusher, two sets of rolls, trommels, jigs, two pulsator jigs, Callow screens, and tanks; a Huntington mill for re-grinding the jig middlings; five Wilfley tables and three Diester slime tables. By a system of classifying and concentrating they obtain a lead and iron concentrate, an iron and copper product, a lead and iron middling. F. M. Wichman, mill superintendent, states that the ratio of concentration is 3 to 1. H. J. Turley is general superintendent.—The Utah-Apex mill has been re-modeled and is ready to operate on a lead-silver ore. William Carkeek has charge of the mill.

Salt Lake, October 18.

TOOELE COUNTY.

(Special Correspondence).—Development of the Western Utah Copper Co.'s properties, in the Deep Creek district, during the last six months, has resulted in opening 100,000 tons of copper ore claimed to assay 5%. It resulted, also, in opening a body of lead-carbonate ore 70 ft. wide that is said to assay 5 to 45% lead, and 5 to 45 oz. silver per ton. This body has been opened to a depth of 300 ft. No shipments will be made till closer railroad connections are made as the hauling to the nearest station on the Western Pacific road is too far to admit of profitable shipping. This is one of the properties of which Duncan McVichie, of Salt Lake, is manager. Mr. Humes is in direct charge.—E. S. Leaver, former manager of the Goldfield Reduction Co.'s mill, at Goldfield, has taken a lease on the Daisy mine and mill, on the West Dip, in the Mercur district. The property has been idle several years, and Mr. Leaver will re-open the mine and repair the mill. He will add to it such equipment as is necessary to cyanide the slime separately from the sand.

Mercur, October 16.

WASHINGTON.

CHELAN COUNTY.

The Supreme Court of Washington has handed down a decision that J. H. Holden is the owner of the entire Holden mine, in the Lake Chelan country, and that he is entitled to the entire proceeds from the sale of the property to Jay P. Graves, of Spokane, and his associates. The decision means \$500,000 to Holden and a corresponding loss to W. S. Denny, of Seattle, who sued for a half interest in the property. Holden and Denny were formerly the closest of friends. They were on a hunting trip together in the district 11 years ago, and Denny turned over his share of the provisions to Holden to go on a prospecting trip. The result of that journey and grubstake was the discovery of the famous Holden copper mines. It was a hard property to develop, and finally Holden gave an option to the Graves interests whereby the latter assumed control of the property. Denny filed suit for his interest in the mine a year ago, and the Supreme Court ruled that a man who waited ten years to assert his interest, can hold no valid interest in the property.

FERRY COUNTY.

(Special Correspondence).—Two months have been devoted to mapping and making a petrographical study covering 56 sq. mi. of the Republic mining district by the Washington State and United States Geological Surveys. A report on the mineral resources of the district will be published. Waldemar Lindgren, of the United States Geological Survey, supervised the field work the last three weeks.—The lessees of



Map of Washington.

the Ben Hur mine are employing nine men, stopping ore on the 125-ft. level, and are unwatering the shaft to resume work on the 250-ft. level. The leasing company is operating three machine-drills and shipping about 100 tons of ore per week, which assays from \$10 to \$30 per ton. Large quantities of low-grade ore are being mixed with high-grade material, to make a fair average for shipment. A new ore-shoot, 4 ft. wide that assays \$45 per ton has just been opened.—Ore is being stoped above the intermediate level of the Black Tail mine. Five carloads were shipped during the past month, and two more are ready to ship. This property has recently been purchased by Spokane people, with F. E. Pritchard, of Rosalia, the main stockholder.—The Flag Hill mine is again in operation, after several years of idleness, having passed into the hands of the Flag Hill Mining Co. John Gatenbein, of Republic, is manager. A 12-in. vein is being opened which assays from \$50 to \$100 per ton. Three veins have been prospected on the Flag Hill by open-cuts, adits, and shafts.—The Midget mine, formerly known as the Tom Thumb, has been leased by the New Republic Co. for three years. It was opened by the Tom Thumb Gold Mining Co. to a depth of 400 ft. and is fully equipped with a steam boiler and hoisting engine; a Leyner air-compressor and drills, and electrical machinery for lighting the mine. The property has been opened by drifts on three levels and a cross-cut to the vein on the fourth. The former management estimated about 10,000 tons of \$9 ore is blocked out in the mine. A carload was shipped several years ago, which assayed \$23 per

ton. A spur of the Great Northern railway was built to the mine at that time.—The Oversight Mining & Milling Co. has installed a new hoisting engine at the No. 36 shaft to sink on the iron sulphide vein discovered last fall. The shaft is down 43 ft. in ore.—The Southern Republic Co. has unwatered the Princess Maud shaft below the 500, and, as soon as the mine is thoroughly drained, will resume work on the 600-ft. level.

Republic, October 18.

OKANOGAN COUNTY.

(Special Correspondence).—Negotiations are pending at Camp Hilbert, near Ruby, with an English syndicate for 120 mining claims, including the Index, Crescent, and Wolverton. Fred A. Bell, a broker of New York City, is financing the deal, and a holding company will be organized with a capitalization of \$25,000,000.—The old Ruby camp is having a revival of mining activity, after a dull period extending over several years. One of the indications is the installation of machinery by the Mine Operating Co.—The German-American Mining & Milling Co., owning seven claims south of Oroville, will begin development immediately. The claims are on a contact vein from 40 to 100 ft. wide, and contain gold, silver, copper, and lead, in quartz gangue.—The Golden Chariot Mining Co., owning four claims on Goat mountain, five miles northwest of Oroville, is sinking a shaft, now down 240 ft., on a contact vein, with ore assaying from \$17 to \$63 per ton in gold, silver, and copper.

Oroville, October 15.

STEVENS COUNTY.

(Special Correspondence).—The Factor Mining Co. is organizing to develop the Factor group of claims, on First Thought hill, near Orient. At a depth of 10 ft. an ore-shoot was cut that assayed \$17.50 per ton.—The Liberty Copper Mining Co., operating near Chewelah, has ordered an air-compressor, power-drills, steam hoist, and 100-hp. boiler. A large vein of copper ore has been opened on the adit level. A shaft will be sunk, and new levels driven. The company expects to ship ore as soon as the machinery is installed.—The Lehigh Cement Co. is to build a plant at the junction of the Pend d'Oreille river and Sullivan creek, near Metaline, which will be operated by a 10,000-hp. hydro-electric plant to be erected on Sullivan creek by the Sylvester Engineering Co.—The Deer Park Mining Co. has about completed the construction of its concentrating plant and will start it up in a few days. The water will be taken from a creek about 200 yards distant and the company will commence shipping concentrate in the early part of December.

Deer Park, October 18.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—In the Le Roi mine at Rossland one of the diamond-drills on the 1600-ft. level has cut a 4-ft. body of rich ore.—For the month of August the Le Roi No. 2, Ltd., shipped 3010 tons of ore, averaging \$23 per ton, and is now shipping 450 tons per week. A station has been cut in the new shaft at the 1000-ft. level.—The new compressor at the Inland Empire has been started.—At the Athabasca mine, near Nelson, where development has been carried on actively for some time past, a large body of rich ore has been uncovered.—Two gold bars, weighing together about 40 lb., were shipped from the Nugget during the past week. This shipment of bullion, valued at about \$8000, represent a four weeks run at the mill. There is a little work going on in Poplar Creek district all the time, although the boom has dropped. E. Mobbs has sent a 3-ton shipment to Trail smelter from the claim he is operating, and it is claimed that if it runs \$4 per ton gold it will pay to operate. Ten men are employed at the Society Girl mine, at Moyle. Some ore has been found in the upper workings assaying 67 oz. silver, 7% copper, and 58% lead. It is expected to cut this orebody in No. 2 adit now in 850 ft.—The incline on No. 5 seam at the Hosmer mine, at Hosmer, has been started. This company owns five miles of rich coal land adjoining the Crows Nest Pass Coal Co. holdings. It is a subsidiary company of the Canadian Pa-

cific Railway Co., which uses most of the output.—In the work and shipments of the mines near Phoenix during the past week interest attaches to the increased shipments of the Oro Denoro and Mother Lode properties of the B. C. Copper Co. to the Greenwood smelter. The Oro Denoro increase was 900 tons and the Mother Lode about 500 tons over the previous week. Since P. S. Couldrey, lately with the Le Roi No. 2, Ltd., took over the superintendence of the B. C. Copper mines, the output has been steadily increased.—Granby shipments dropped about 900 tons during the last week, owing to the breaking down of one of the big crushers at No. 2 outlet. For the year ending June 30 last the actual cost of making and marketing copper at the Granby was 10c. which was 24c. lower than for the preceding fiscal year. It is anticipated that with the improvements added this year this cost will be reduced to 9c. per lb. The surplus on above date was \$2,698,687, which is \$243,507 greater than for the previous year. Cash and copper figure \$600,459, about \$178,834 more than for the prior year.—On the Vernon claim, Camp McKinney, a 4-ft. vein of galena ore has been opened. The Bruce mine at Midway is in financial trouble and some of the miners have not received their wages. J. Cleveland Haas, of Spokane, the consulting engineer, states that the company's debts will be paid.

Rossland, October 15.

MEXICO.

CHIHUAHUA.

The properties of the El Porvenir Mining Co., near Parral, have been taken over by the Compañía Minera La Corona and a small mill will be erected on the ground. The latter company will issue bonds to raise money necessary for the construction work.—The Ricamole Mining Co. is to resume operations at its property northeast of Parral.

DURANGO.

The Boca del Cobre Mining Co. has opened a body of high-grade copper-silver ore on the sixth level of the El Rosario mine, and is sinking to the seventh. The average assay of the ore shipped from the fourth and fifth levels was 7½% copper and 100 oz. silver per ton.

JALISCO.

The State Government has just granted a concession to James H. McCreery and Richard Ivey to construct an electric railroad from Magdalena, the present terminus of the



Amparo Mill.

Southern Pacific, through Hostotipaquillo to the Santiago river at a point near the Cabrera mine of the Virginia & Mexico Mine & Smelter Corporation.

OAXACA.

The largest denouncement ever made in this State has recently been published by the local land office. The property which consists of 61 claims is called La Escuadra and was located by Fred Woolrich.—F. D. DeVote, of the Rio Seco Mining Co., has taken six pertenencias in the Etla district. The property has been named Pelado Grande and the minerals present are gold and silver.

SONORA.

A 2500-ton lot of rich copper and silver matte was sent to the 4-C smelter at Cananea from the El Triunfo mine. This is the second shipment from this property.—The Badger Mining Co. has commenced work on its property in the Arizpe district. C. H. Waters is manager.

Special Correspondence.

NEW YORK.

Copper Surplus and Sales.—Davis-Daly Contest.—La Rose and Nipissing. — Kerr Lake to Pay Large Dividend. — Ely-Central. — Camp Bird.

The interest in copper circles was this week centered largely in the forthcoming figures of the Copper Producers Association. The accumulated copper surplus is and has been for some time the chief obstacle to higher prices. Buyers have seen no reason for committing themselves for future consumption so long as the market has failed to show any material gain in absorption. The September statement of the Association was made public the first of this week. Its showing had been pretty well discounted. It was expected that there would appear an increase in accumulated surplus of about fifteen million pounds of copper. The exact figures given out are 15,840,207 lb. Added to the accumulated surplus for the eight months preceding, the total surplus on October 1 is estimated at 151,472,772 lb. Of this gross figure, 122,357,260 lb. was on hand January 1, 1909, so that the real increase for the year up to October 1 is 29,115,512 lb. This accumulation is not at all alarming when the fact that many producers have been added is considered, and the further fact that the country has been slowly recovering from a depression which brought to a standstill many industries, such as the building of inter-urban trolley lines and the installation of new telephone plants, which in normal times are among the heaviest users of copper. It is not the weight of the copper surplus in and of itself that makes it at all a grave feature, but the fact that until it begins to melt it will be difficult to bring buyers into the market for anything beyond immediate needs.

Deliveries of copper during September totaled 102,182,932 lb., which, as was the case in August, was divided almost equally between domestic consumption and delivery for export. The Association estimates the foreign visible supply of copper at 197,608,320 lb., giving the world's present accumulation a total figure of 349,081,092 lb. One of the members of the Association states that an effort is being made to get the chief interests abroad to join in an organization similar to that of the Copper Producers' Association in order to have available figures which will adequately cover the output of the entire world.

The contest which has been waged in Davis-Daly is evidently at an end. The annual meeting has been adjourned to October 15, and no further court proceedings are expected. F. A. Heinze appears to have the support of all but the Boston stockholders, and these are now to have two members on the board of directors.

The open market has exhibited several interesting features during the week. The advance in Tuolumne, an upward spurt in Ely Central, and a vicious raid by the bears upon La Rose and Nipissing being the chief incidents. There has been no explanation as to what brought about the sudden drop in La Rose. The property now stands at the head of the list of shippers at Cobalt; it is reported to have in its treasury a surplus which would admit payment of the present dividend of 16% for a year if no further ore was produced; the development of the Lawson property recently acquired is just well under way, and it is expected that this ground will prove to be quite the richest yet explored in the camp. Notwithstanding this situation a strong drive was made at both La Rose and Nipissing on Friday, and the former was sold off from 7½ to 5¼, the latter from 11% to 9%. Apparently the break was caused by the liquidation of some large holder, either forced to sell or who threw his holdings on the market because dissatisfied with the consolidation plans. Not all of the interest in the Cobalt market was centered in Nipissing and La Rose. It is semi-officially announced that Kerr Lake expects to take the place at the head of the column of dividend payers with a declaration of 31¼%, which will amount to \$1.60 per share.

Ely Central is being made the medium for a big advertising campaign and the market has been hoisted to 2¼ per share. The enthusiasm which the public has developed for the low-grade milling or 'porphyry' coppers seems to prevent analysis of conditions, as is necessary in estimating the value of copper properties which at the best are five years from the point where a pound of copper could be produced at a profit, and to which in other cases still graver objections may be urged.

Among the London mining stocks active in New York, Camp Bird continues to hold attention. On the strength of the option obtained by the Camp Bird, Ltd., upon the Santa Gertrudis the London market has been an active buyer, and much higher prices seem to be anticipated both here and on the other side.

WASHINGTON.

Report of Land Office.—Unrecorded Titles —Changes in Regulations.

The annual report of Fred Dennett, Commissioner of the General Land Office, has just been made. The report shows that the total area of land entered during the year amounted to 19,090,356 acres, a decrease of 1,907,209, as compared with 1907. The total area upon which final proof was made is 8,068,044.85 acres. The public lands remaining amount to 754,895,296 acres. The total cash receipts from the sales of public lands were \$11,492,453. Mr. Dennett makes a number of recommendations. He asks that legislation be enacted that will permit of all lands which are to be brought under an irrigation project being withdrawn from entry at the time of the announcement of the enterprise. Under the present law, the lands are open to homestead entry immediately upon the declaration of the project. A law specifically providing for the punishment of persons who fraudulently obtain or attempt to obtain title to public lands is asked. Heretofore such offenses have been prosecuted under the statute punishing conspiracy to defraud the Government, and under the laws prescribing penalties for perjury and subornation of perjury. The Commissioner makes the statement that the appropriation made by Congress for the transcribing of the field notes and tract books destroyed in the San Francisco fire lapsed on December 31 last, and that no provision has since been made for the copying the plats of mineral surveys, so that the Surveyor-General has to make exhaustive researches in the field notes for the purpose of ascertaining conflicts in proposed mineral surveys. This necessitates great additional labor and cost. The Commissioner asks for an appropriation of \$8000 to carry on this work. There are now in the general and local land offices some 400,000 patents to land which it has not been possible to deliver to entrymen. In these cases the successful applicant has been satisfied to record the receivers' receipt and has then, for some reason, ceased to call for mail at his last known address. The Commissioner declares that some step should be taken to have these muniments of title properly recorded. In many instances the patents are for lands in States in which all the public lands have been exhausted for a number of years, such as Indiana, Ohio, and Illinois.

The following changes in the regulations are promulgated by the Commissioner: Settlers, residents, and individual miners and prospectors in Alaska are permitted to take, free of charge, and without previous permit, timber not exceeding \$50 in value in any one year for their actual use for domestic purposes. Timber is disposed of in larger quantities to the persons named and to residents and those doing business in Alaska upon application to the receiver of the proper land office, and after appraisal by a special agent and deposit of the appraised value, cutting is permitted to begin; subject, however, to stoppage of the cutting in event of non-compliance with the terms of sale. Declaratory statements and entries are not received upon coal land withdrawn for classification, but those who have opened and improved coal mines during the period of withdrawal are permitted to file in the proper land office a notice of claim, and upon classification of the land, are permitted to assert their formal claim to purchase at such price and upon such terms and conditions as are in force at time of the restoration of

the lands. Affidavits in coal land cases may be made before the register or receiver, or any officer authorized to administer oaths, in the land district where the lands are situated. Abstracts of title, prepared by duly authorized abstractors, are received as evidence of title to mining claims and of water rights when the abstractors have furnished copy of existing local statutes by which they are authorized to compile abstracts, and certificates by the proper local officials that they have complied with such statute. Similar evidence of water rights in desert land cases is received upon like showing.

The United States Geological Survey has just published, as Bulletin 395, a report under the title, 'Radio-activity of the Thermal Waters of Yellowstone National Park', by Herman Schlundt and Richard B. Moore, giving the results of recent tests. Typical spring waters from all the principal basins of thermal activity were tested, and wherever gases were evolved from a spring these also were tested for their radio-active properties. Many solids, consisting of spring deposits, water residues, and rock samples, were examined quantitatively for the radium content. The determinations were all made by the electrical method. The results show that the underlying rock in the park contains radium and in some localities thorium in sufficient quantities to make the waters and gases decidedly radio-active. No tests were made to determine the presence of helium, which is a constituent of the gas escaping from several of the more active European springs.

LONDON.

Zinc.—North Broken Hill and Broken Hill South Silver, Reports.

The various mines at Broken Hill have received considerable attention in London lately, partly owing to the success of the zinc tailing plant at the Zinc Corporation and the great activity of the De Bavay's Treatment Co., both of which ventures promise to place Broken Hill in a strong position in the zinc market. But apart from the zinc question the mines have received a much closer study since the announcement of the approaching exhaustion of the Proprietary company's deposit. Two of the most promising companies on the range have issued their reports this week, and as they have been closely scanned here, it is appropriate to give some account of them. These companies are the North Broken Hill and the Broken Hill South Silver. They are situated at opposite ends of the range, and both have done exceedingly well recently in spite of the low prices of lead and silver, which have been sufficient to suspend the profits of some of their neighbors.

According to the report of the North Broken Hill for the half year ended June 30, 66,797 tons of ore was treated, averaging 15.9% lead, 7 oz. silver, and 14.3% zinc. The yield of lead concentrate was 11,372 tons, assaying 70.87% lead, 21.83 oz. silver, and 6.61% zinc. The recovery was 75.38% of the lead and 53.63 of the silver. In addition 33,842 tons of zinc tailing averaging 19.9% zinc, 3.9 oz. silver, and 4.2% lead was produced, together with some slime and barren tailing. The whole of the zinc tailing has been delivered to the De Bavay's Treatment Co. A new mill is in course of erection and will be completed toward the close of the year. This mill will treat 5000 tons of crude ore per week and the output will therefore be greatly increased. With regard to the ore reserves no definite figures are given, but the mine is opening up well at all levels as far as has yet been sunk, namely 1130 ft. The whole of the output of lead concentrate has been sold up to the end of 1914. The working costs during the half year in question were: mining 9s. 11½d. per ton, milling 3s. 6¾d., development 1s. 7½d., or a total of 15s. 1¾d. per ton. The profit and loss account shows receipts of £82,765 from lead concentrate and zinc tailing, working expenses £51,559, administration and taxes £2717, dividend £14,000 (at the rate of 20% per annum on the capital of £140,000), and capital written off £13,095.

The Broken Hill South Silver M. Co. reports that during the half year, January to June, the amount of ore raised was the greatest of any half yearly output during the 16 years history of the mine, namely 137,848 tons, as compared

with 112,288 during the previous half year. The assay value of the ore raised was 14.9% lead, 12.1% zinc, and 5½ oz. silver. From this ore was produced 20,746 tons of lead concentrate assaying 73.6% lead, 4½% zinc, and 19.3 oz. silver; 41,563 tons of zinc tailing assaying 4% lead, 18.7% zinc, and 3.4 oz. silver; 58,368 tons of second-grade tailing assaying 2½% lead, 10% zinc, and 2 oz. silver; and 17,162 tons of slime assaying 12.7% lead, 12% zinc, and 5.7 oz. silver. Owing to the limited demand for lead in the early part of 1909, the concentrating mill did not run at its full capacity, but toward June the output was raised to over 1000 tons per week. The whole output of lead concentrate for the remainder of 1909 has already been sold and negotiations are practically concluded for the disposal of the product for a number of years. As regards the disposal of the zinc tailing, some of this material is already being sold to the Zinc Corporation. Recently additional contracts were made with the De Bavay's Treatment Co. whereby some of the tailing will be supplied at 3s. 9d. per ton to be treated by the present plant, and a further supply treated by the new plant for a period of seven years. The price to be paid for the latter is 3s. 6d. per ton on delivery, and after another 3s. 6d. has been credited to the De Bavay Co., the remaining profit is to be divided equally between the two companies. In spite of adverse circumstances ruling at Broken Hill, the working costs have been still further lowered. Mining costs were 9s. 2½d. per ton, development 9d., and concentration 3s. 11d. The income from the sale of lead concentrates was £155,922, and receipts from the Zinc Corporation £4032, making a total of £159,954. The mine costs totalled £109,441, leaving £50,513 to go to profit and loss account. General administration, office expenses, and taxes absorbed £3900, and £10,742 has been written off for depreciation. Dividends amounting to £40,000 were distributed, which is at the rate of 48% per annum on the paid-up capital of £163,508. The ore reserves are estimated at 3¼ million tons above the 970-ft. level, which level continues to open up in a satisfactory manner. In addition the company has 1¼ million tons of zinc tailing and slime stacked on the surface.

GOLDFIELD, NEVADA.

Mill Additions.—Clermont Ore-Shoot.—Florence Mill.—Daisy Stops Company Work.—Nancy Donaldson.—Combination Fraction.

Official announcement has been made that the first step in increasing the capacity of the Consolidated mill will be the placing of six 6-ft. Chilean mills in the present structure. It is planned to have these in operation within 90 days. The mills, together with the necessary tanks, tables, etc., will be purchased from various manufacturers and in-



General View of Goldfield.

stalled by the company. This additional machinery will increase the capacity of the plant to nearly if not quite 800 tons daily. The increased capacity will result from the ability to feed a greater tonnage to the stamps as the Chileans will relieve the tube-mills. It is computed that fully 75% of the ore now being put through the latter will go directly to the tables from the Chilean mills. The work of clearing away the remaining portions of the wrecked Combination mill is going forward. The lower workings are being cleaned up and supports installed. Production will be from the caved area on the fourth and fifth levels and

by far the greater part of the caved material will be treated in the mill. A large crusher will be installed between the apex of the Combination vein and the railroad and from it a belt-conveyor will carry the ore to the company's steel hopper-bottom cars. Stopping is now in progress on this vein at the southern end of the Combination No. 1, and on the Combination No. 2, where ore of excellent grade is being taken out for a width of 20 ft. in places at the fourth level, and the ground is being explored at the fifth level. The cross-cut from the Combination Fraction at the 600-ft. level is being driven across the Combination No. 1 toward the old workings of the January mine.

Development on the three lower levels of the Clermont continues to yield gratifying results and preparations are being made to begin stopping in the rich orebody opened at the 730-ft. level. A raise is being driven to the 600-ft. cross-cut from the Mohawk. The work continues to expose high-grade ore in large quantity and the company's revenue can easily be increased at any time. After passing through 27 ft. of high-grade ore at the 730-ft. level, lower grade material was found, and further cross-cutting has been suspended. The ore-shoot, known as the Mohawk-Jumbo or Macmillan ore-shoot, has now been opened at the 260, 600, 730 and 860-ft. levels, and miners employed in the Clermont declare that the 1000-ft. level is about to enter the same vein. At every point where the shoot has been penetrated it is shown to be of great value and of large size. The ore-shoot at the 860-ft. level is only less rich than at the 730-ft. level. The vein was penetrated for a distance of 8 ft., and the face sampled from \$300 to \$1000. Drifts are being driven both ways along the hanging wall, but both at this depth and above the ore apparently improves in quality as the foot-wall is approached. A peculiarity of this ore-shoot lies in the fact that at the deeper levels the ore responds more readily to treatment by milling than that found nearer the surface. At this depth the ore occurs in latite, a formation which was formerly believed to be barren and which underlies the dacite that was supposed by many to be necessary to deposits of gold ore in this part of the district. The latite appears also in the Florence and Combination Fraction and as far south in the district as the C. O. D.

The Florence mill is now operating at nearly its full capacity of 160 tons daily with the newly installed machinery running smoothly. The assurance is given that there will be a large and steady output of bullion. Experiments are being conducted with a view to installing a chemical plant by means of which the concentrate will be treated in a manner similar to that employed by the Consolidated. A spur track has been built from the line of the Tonopah & Tidewater railway. The system of development instituted by the new superintendent, Willis Lawrence, has opened additional reserves of both high-grade and milling ore, and a shoot opened on the sixth level in the Engineers' vein, has exposed a wide seam of rich ore carrying free gold in quantity and accompanied by 4 ft. of excellent milling ore. For its entire width this ore is worth fully \$200 per ton.

Operations on company account will probably be suspended indefinitely on the Daisy unless results show material improvement before the expiration of this month. The high cost of marketing the product, together with the fact that, owing to the character of the ore, it must be sent to the smelters, has rendered it impossible to make a profit from any save the richest ore found in the mine, and although the company for seven months succeeded in making a small profit above its operating expenses, it has been decided to suspend company work. There are six leases now on the Daisy, and at three points high-grade ore has been exposed and shipments made. Lessees working from the No. 2 Company shaft have opened a strong vein and have begun shipping as have the Golden Daisy and the Millard-Jones leases, and it is reported that the Toplitz lease will resume operations shortly. From a point near the end of the company tunnel on the Columbia Mountain mine, lessee Thomas will drive to the vein which has been opened at a depth of 110 ft., and will raise to connect with his shaft. The vein is of excellent character, lying between granite and porphyry, a condition unique in the Goldfield

district. Samples of the ore have yielded as high as \$2000 per ton.

The Nancy Donaldson shaft is down 135 ft., and besides opening seams of high-grade ore near the surface, has passed through a large body of low-grade ore and the management is greatly encouraged with the showing. This prospect is situated nearly nine miles east of the town of Goldfield and on the Red Mountain mineral belt. Good ore has been opened at a depth of 400 ft. in the Diadem lease on the east end of the Great Bend. On the Merger Mines Co.'s claims high-grade ore has been exposed in seams and a number of shipments made from time to time. The Combined Mining & Leasing Co. will soon resume driving for the junction of two of the best veins in this part of the district, and from which high-grade has been mined near the surface.

Combination Fraction has been one of the chief centres of interest of late owing to the discovery of a large and rich orebody and the declaration of a dividend. Despite the small area, about eight acres, the mine has been a favorite, and most flattering predictions regarding its future have been made because of its situation. On all sides of the Fraction are claims that have been highly productive, including the Mohawk, Combination, and Jumbo of the Consolidated, and the Florence and Cornishman claims of the Florence. High-grade ore was mined at two levels on the Mohawk up to the boundary line of the Fraction though these ore-shoots have not produced rich ore on the latter. Recently the output of the Fraction has been around \$50,000 monthly, and is expected to exceed this amount. The increase in the mill-heads have been raised from \$25 to \$40 per ton since mining on the new vein began. George Wingfield personally controls the Fraction, which, by the terms of an agreement entered into over two years ago with the Consolidated, is forever immune from litigation arising from apex disputes.

SALT LAKE, UTAH.

**Ohio Copper Mill —Salt Lake Men in Ely —Deeper Mining for Tintic.
—Ajax Sold to Loose and Associates.—Daly-Judge Gets More Ore.**

Colin McIntosh, general manager of the Ohio Copper, says that three of the seven sections of the steel trestle work are completed, and that the entire work should be finished within the next 30 days. Lack of experienced erecting men has delayed the work. Two units of the reduction plant are ready, and the contractors are now at work on the third section of the mill. The first unit will be commissioned immediately upon the completion of the trestle, which connects the Mascot tunnel with the mill. The management expects to have the entire mill in operation within a few months time, and while the capacity is nominally only 2250 tons, Mr. McIntosh expects to treat 3000 tons and make more than an 80% saving. The plant includes both Chilean mills and stamps.

Salt Lake mining men control some of the smaller properties in Ely. Among these are the McDonald-Ely, Federal Ely, Ely Witch, and a number of other properties in the low-grade porphyry belt. Recently there has been considerable activity in these stocks, and it has leaked out that Cole-Ryan interests are after more territory in that section. Some of the largest owners in these properties have acknowledged that they have been approached, and one of the largest individual shareholders in McDonald-Ely has been offered a price equivalent to 100% profit on his original investment. Development in this ground has shown some large deposits of ore assaying more than 2% in copper. Salt Lake mining men are inclined to add to their holdings in the Ely district, rather than sell. D. C. Jackling is reported to be seeking a footing in Ely. As both Cole-Ryan and the Jackling forces are reported to be actively engaged in buying Ely territory, it will mean sharp competition. A formidable rival for the Nevada Consolidated, Cumberland-Ely, and Giroux companies seems likely.

Deeper mining is being carried on in the Tintic district. The Knights have sent the main shaft of the Iron Blossom down 11,000 ft. Drifts from the lower levels has opened some large deposits of lead carbonate. J. Will Knight has

been appointed general superintendent. The Colorado workings are to be extended downward 1000 ft. or more, and it is expected that this, with the deep workings in the Beck Tunnel ground, will result in discovery of the orebodies believed to exist in the Crown Point territory, another Knight property. The May Day in Tintic has reached a depth of 1100 ft., and driving is now progressing from this level toward the ore that was uncovered 100 ft. above. Sioux Consolidated is to be developed to a greater depth. Colorado and Sioux are doing well, as evinced by the posting of the regular dividends of 8 and 7c. respectively last week. The Uncle Sam Consolidated made its regular distribution of 8c. The closing of the Tintic smelter put the Iron Blossom out of the dividend list for September, the company being unable to get returns from the United States company in time.

The Ajax Mining Co. has passed into the hands of C. E. Loose and associates, of the Grand Central, Carisa, Victor, and other big mining properties of the Tintic district. The Ajax property has been under the management of Thomas Weir for more than ten years. It was a great producer in the early days and paid dividends amounting to \$1,000,000. Its workings have attained a depth of 1100 ft., but the ore in the lower workings was of too low a grade for profitable handling. Mr. Loose and his associates own some adjoining ground, known as the Golden Chain and Cleveland groups. They have quietly gathered up the controlling interest in Ajax stock, and now propose to consolidate with the ad-

ment for the reason that some litigation has been going on for a year past as to the title of two of its ore-bearing groups. Of recent date this company has opened a deposit on the 1300-ft. level on which they have raised 140 ft., and the extent of the ore has not been determined. It is a sand-carbonate which can be literally shoveled out, without the aid of blasting and requiring very little effort to break down with picks. It is similar in character to the rich ores that have been found on the 700 and 1100-ft. levels, from which the management has been able to mine a large portion of the immense dividend that has been paid by this company during the last 20 years. One of the consulting engineers of the company is authority for the statement that this late development will be the means of doubling the value of the property, which has been the greatest silver-lead producer in Utah for ten years.

BUTTE, MONTANA.

Colorado Mine Reduces Force.—Criticism of Management. — American Metal Co. and Zinc Deposits.

A number of men have been laid off at the Colorado mine by the Davis-Daly Copper Co. It has been stated in Butte that the reduction of the force in no way lessened activity in development or mining, but that it was in the interest of economy. A man closely associated with the company made the statement that economy was necessary, as he understood that the treasury was practically empty. He declares that a most expensive policy has been pursued and that mining has been done at a great loss to the company for no other purpose than to be able to say to the public that the company is "shipping ore" and is in a "producing stage." "Splendid results have followed the development at the Colorado, and I believe a big mine will be opened there," said the Davis-Daly stockholder referred to above, "but it is an absurd and dishonest policy to mine and ship ore while development is going on and the mine is not sufficiently opened. The ore shipped is of a low grade, the average being little above 3% copper. The best interests of the company have been sacrificed in order to advance personal interests." While there has been a great deal of criticism of the Heinze management on the part of stockholders in Butte, with only a few exceptions the Butte shareholders sent their proxies to Mr. Heinze to be used by him at the annual meeting.

In the opinion of men familiar with developments in the Colorado mine, that property is certain to become a big and important producer. The company is accomplishing some record work in development. It is expected that the big vein will be reached by the cross-cut on the 1500-ft. level within the coming week. The Colorado is the only property of the Davis-Daly company on which any work is being done.

The advent of the American Metal Co. into the Butte district has attracted attention to the large zinc-ore deposits in Butte mines. An old report on the Emma mine, formerly owned by the Butte Mining & Development Co., now the property of the Butte Copper & Zinc Co., shows that between the 400 and 800-ft. levels there is an orebody 130 ft. wide, the largest in the Butte district, and that the assays taken in 1903 gave from 16 to 32% zinc, with a high percentage of lead, some gold and silver, and a fraction of 1% copper. The property has been closed and the surface plant dismantled ever since the failure of the Butte Mining & Development Co., which forfeited its option on the property. The Butte Zinc Co. later acquired the Emma, but has never done anything with it. The Sieligmans and others of New York are interested in the Butte Copper & Zinc Company.

The American Metal Co. is making preparations for the erection of the zinc concentrator for the Butte & Superior Co. It is now stated that the plant will have a preliminary capacity of 500 tons per day. The contract between the American Metal Co. and the Butte & Superior provides that the former will advance \$250,000 to the mining company, \$150,000 of it to be used in building the concentrating plant and \$100,000 to be added to the treasury of the mining company and to be used for development. The Metal company contracts to purchase the product of the concentrator for a



Eastern Nevada and Western Utah.

joining properties and work through the deep shaft of the Ajax property. The surface workings of the Golden Chain and Cleveland show some first-class deposits of silver-lead and copper ore, and with greater depth they expect to get a producer of considerable magnitude. It is understood that the general offices of the new company will be removed from Salt Lake to Provo.

Daly-Judge is adding new laurels to the recent ore deposits tapped at a depth of 1400 ft. In the Daly stope they have just cut some water courses that are producing a good tonnage of first-class lead ore. The flow is being handled through the drain tunnel at the 1200-ft. level. George W. Lambourne, general manager, says that they will not attempt to make a heavy extraction until they have completed the tunnel, which is being driven from the Snake creek side of the range. This will drain the property below the 1800-ft. level, and then both the first and second-class product can be mined economically. The Daly-Judge has one of the largest mineral-bearing estates in Park City. Since operations were first begun the management has been much troubled with water. The new tunnel will drain a large area on what is known as the Bonanza Flat country, and a number of companies have signified their intention of beginning operations.

New orebodies developed in the Silver King Coalition Mines ground, at Park City, is of frequent occurrence. The owners are not inclined to give out an account of develop-

period not less than five years, the price to be paid being governed by the price of zinc and the quality of the concentrate. It is understood that the Butte & Superior will receive about \$3 net per ton for its ore, and there are now no less than 1,000,000 tons blocked out in the Blackrock mine.

DENVER, COLORADO.

A. I. M. E. at Leadville, Pueblo, and Colorado Springs.

The members of the American Institute of Mining Engineers who have been in the West, spent October 10 and 11 in Colorado. After a brief stay at Glenwood Springs their train was taken to Leadville, where a number of members of the party visited the Yak tunnel and mill. From Leadville the party went to Pueblo, where the men spent the day, while the women went on to Colorado Springs and Manitou.

At Pueblo the Denver & Rio Grande furnished a special car and detailed an engine to serve the party. In this way no time was lost in traveling from one plant to another, nor in getting refreshments, which were served on the train. The first plant visited was the Minnequa plant of the Colorado Fuel & Iron Co. Here the iron was traced from the ore-bin through the plant to its final form in finished rails. The physical test of dropping a 2000-lb. weight on a 5-ft. section of the rail from a height of 20 ft. was very instructive to the travelers. The plant of the United States Zinc Co. was next on the list. Here the party saw the magnetic separation of zinc blende from iron sulphide. The revolving water-jacketed cooler in which the ore is chilled after a light roast came in for a large share of the attention. At the copper-lead smelter of the American Smelting & Refining Co., the party was shown the modern pot-roasting process alongside the old reliable hand-rabbed reverberatory furnaces. Some of the members of the party professed to recognize the Coeur d'Alene ore in some of the bins; others of the party were not so sure, although they had seen it in place only a short time before. Dr. Raymond, however, relieved the gravity of the situation by remarking as the party stepped aboard the lift to descend to the floor below, that he hoped that we would all recognize the lore of smelting.

The special car was coupled to the 5 p. m. train for Colorado Springs, where the party reunited and left that night for Chicago. The stay in Pueblo was most enjoyable, and the members of the party wish to express their appreciation of the courtesies shown them by the managers of the several plants, who, so far as possible, personally conducted the party.

JOHANNESBURG, TRANSVAAL.

Transvaal Tin.—A Geological Survey Memoir.—Public Criticisms.—New Modderfontein's Bold Policy. — Sand Filling of Stopes. — Rhodesian Gold. — Survey Connections in Deep Level Mines. — Cooling Towers.

Although the Transvaal cannot be compared with the other British colonies of Australia and Canada in the matter of publishing official reports on its mining fields, it is showing greater enterprise than hitherto. The principal and almost absorbing task of the Geological Survey has been mapping districts irrespective of relative industrial importance. The work to date has covered several mining areas, such as the Pretoria diamond fields, the Lydenburg goldfield, and the Bushveld tin districts. A memoir has just been published on the Waterberg tinfields, which has caused many to regret that matters other than scientific have been treated. The bulk of this memoir consists of a geological report by H. Kynaston and E. T. Mellor, as admirable a treatise as we may always expect from these highly qualified Government geologists. A final chapter, however, is devoted to 'Economic Aspects', and is written by U. P. Swinburne, Pretoria Inspector of Mines. This section is not above criticism; it deals too fully with the items of plant which chance to have been erected (often by amateurs in tin-mining) and too sparsely with mining prospects and conditions. But it certainly has not deserved

the storm of abuse—sometimes bordering on the personal—which has been poured upon it by the interested parties. The criticisms of the report are not of a character to encourage Government officials to extend the policy of dealing with the industrial side of mining. The most valuable feature about the report is that it is a thoroughly honest attempt to describe things as they appear to a mining engineer (who does not claim to be a tin expert). As such, it is much more valuable than many of the more pretentious reports of engineers employed by syndicates. Its chief defect appears to be a lack of pluck (perhaps excusable in view of present 'criticisms' of most moderate and non-committing statements) in failing to estimate future prospects and, when possible, the value and quantity of ore reserves. Records of production—tonnages and yield—would also have been a serviceable addition.

The Waterberg tinfields are the most important in the Transvaal. The large deposits of alluvial tin in Swaziland are the only other occurrences of note in South Africa, excepting the precarious veins to the northeast of Pretoria, and the alluvial deposits near Cape Town. Mr. Swinburne classifies the deposits of the Waterberg under five heads, namely: discoveries in (1) granite, (2) felsite, (3) shales,



Map of the African Goldfields.

(4) quartzites, and (5) alluvial. Classes 1 and 4 are the most significant. The orebodies found in the granite have included some of exceptional richness. On Zadiplaats the ore is found in numerous 'pipes' and chimneys, the deepest pipe extending 400 ft. on the incline, with a working face of 8 by 6 ft. of rich ore. A 10-stamp mill is now at work treating 1250 tons of ore per month, of a value of no less than 8 to 10% tin-oxide. On the farms Roodepoort and Groenfontein there are similar occurrences in the granite, the mill grade averaging lately 6.7%. The chimneys of ore are still strong at 400 ft. deep. In the geological chapters of the memoir, it is pointed out that further facts must be accumulated before the formation of these pipes can be fully explained. It is suggested that they were in all probability formed in an originally deep-seated portion of the granite, which although practically consolidated was still doubtless at a very high temperature and probably at that time had not undergone fissuring to any great extent. Relief of pressure, however, consequent upon the formation of fissures at higher levels, may have initiated the release from the underlying magma of the metalliferous compounds, which would then have ascended in gaseous condition through a practically unfissured zone. The de-

posits of tin in quartzites include the properties of the Weynek Tin Co., Ltd., and the Rooiberg Minerals Development Co. The former contains "two small parallel veins of crushed lode matter," upon one of which sinking has been carried to a depth of 400 ft. This is one of the bodies which was marked by ancient workings. As to the value of the "five different tin-bearing fissures" worked by the Rooiberg company, Mr. Swinburne apparently refuses to commit himself. He devotes two pages to a description of the plant erected and two lines, exactly, to the mine. This is admittedly a flaw in the report, and shows a lack of perspective—or courage. The supporters of alluvial tin in the Waterberg area can find little cause for gratification in Mr. Swinburne's remarks under this head, and it is not improbable that previous reports have been ultra optimistic. So far as we know today, the prospects of alluvial tin mining in South Africa outside the well developed regions of Swaziland, are distinctly poor.

There are few producing mines on the Rand whose progress is watched with keener interest than the New Modderfontein; first, because it is the most easterly important producer of the Rand (the Geduld mill being the only one beyond), and second, because it is rapidly developing into one of the greatest producers in the country. The New Modder (as it is usually termed) has hitherto been milling 30,000 tons per month with 120 stamps and 3 tube-mills. A few months ago an additional 60 stamps and 2 tube-mills were added, making a nominal capacity of 47,000 tons, owing to exceptionally high stamp duties. Now the company is undertaking a bold scheme of advance development, calculated to bring the mine into a fit state for the construction of another mill on the eastern side of the property, at first 35,000 tons in capacity and ultimately 65,000 tons. This will mean that in two or three years, the company will be treating about 1,344,000 tons annually. Practically speaking, the only contingency liable to obstruct these plans is a shortage of labor. It is clear from the review of the position given by Samuel Evans at the general meeting held, at the beginning of September, that there is little to fear in respect to any failure of mine resources. A wholly unofficial estimate of the mill tonnage in the mine may be made at 20,000,000 tons (there are over 1000 reef claims unexhausted) so that with only 75% payable, the mine would appear to be equipped on a highly economical basis, from the standpoint of most profitable life, with the huge crushing capacity mentioned.

Sand from the tailing dump is to be used extensively in the Robinson for stope-filling. The working problem of the mine is a peculiar one. The rich Main Reef Leader, largely stope out, overlies the wide medium or low-grade Main Reef. About 10 or 15% of the ore milled has been drawn from the Main Reef lately and, now that 40 extra stamps have been erected, the percentage is to be increased. When the Main Reef is mined, the total stope width is from 12 to 20 ft., the reef dip averaging 40°. As the hanging wall rock is treacherous, support must be provided. Rock walls and stull-packs have been largely used. These are expensive and material is limited to readily accessible waste from the inter-reef partings. The demand for greater contributions from Main Reef has prompted the management a year ago to make arrangements for sand filling. Steep launders (6 by 6 in.) are carried down, allowing the sand to be easily sluiced from the dump. When the grade of the launder is insufficient to ensure a good flow, more water is added underground. The sand is confined to the stope being filled by rock walls. Over the packs, coconut matting—old filtering material from the cyanide works—is placed to check the sand and allow the water, with very little slime, to flow through. In some parts of the mine it will be possible to utilize the longitudinal and transverse dikes, as containing walls for the sand. This system of sand-filling, practically new upon the Rand, is one that can be extended to numerous purposes, and, now that its practicability has been demonstrated, is likely to be adopted in many mines.

The quarterly meeting of the Rhodesia Chamber of Mines, held in Bulawayo at the end of August, was marked by no announcements of importance. Gold production is not on the increase, among the restrictive factors being the labor

shortage. G. Stewart estimates that fully 10,000 more natives are required. An interesting analysis of the sources from which the Charterland's gold is drawn was given, showing that the production (for the quarter ending June 30), from the mines worked by companies was £327,169 or 49.17%, from the properties owned by companies but worked by tributors, £165,170 or 24.82%, and from the 'small man' mines, £172,993 or 26.01 per cent.

Keen interest is always taken by technical men on the Rand in the results of the surveys in deep-level mines, dependent upon the meridian carried underground by means of plumb-lines in deep vertical shafts. A few weeks ago the connecting levels in the City Deep, Ltd., holed through satisfactorily. The distance between shafts is 5000 ft. and the two shafts are about 3000 ft. deep. In this case the survey was carried on under great difficulties owing to the water raining down. In one shaft there was a considerable convergence of the lines. Details of this survey, however, are not available as in the more recent instance of connecting the Brakpan shafts. There the orientations determined have been found to check up with astonishing accuracy—due largely, no doubt, to good luck, but nevertheless well deserved by the extreme care and skill with which the operations were conducted. It is to be hoped that a scientific description of the work may be placed on record. One shaft was 3700 ft. deep and the other a few hundred feet less. No less than 28 plumb-lines were used, these being fixed in notches in straight edges, placed at the ends of the shaft. For the determination of the mean position of each line, a shadow was thrown on a screen so that the swing was magnified and the extremes easily marked off. Current reports of the work being vague, no account can yet be given of the detailed arrangement. Upon connecting between the two shafts, a distance of 4618 ft., the error in the co-ordinates is stated to have been 0.2 in.—indicating a more perfect connection than one would have any right to expect, whatever the precautions taken to ensure the greatest possible accuracy of observation.

A novel type of cooling tower has been brought to the attention of Rand engineers by John Roberts, Borough Engineer of Durban, who read a paper on the subject before the South African Association of Engineers at the last meeting. The principal features of the tower are as follows: It is built of rectangular frames, without any convergence upward, forming a structure 200 ft. long, 20 ft. wide, and 50 ft. high. The distributing material (brushwood, as usual), does not extend to the bottom of the tower, but there is a space below of 8 ft. The brushwood fills the entire space above as uniformly as possible, for a height of 14 ft. The water has thus to be pumped against a static head of 21 ft. Special provision is made to take full advantage of prevailing winds by doors which can be opened. When open on one side, the bottom of the tower is closed on the other, so that the loss of water is reduced. The most ingenious feature of the plant is the distribution system, which ensures the water being dropped over the brushwood in a finely divided state. The water is led along the length of the tower in ordinary launders, feeding cross troughs, the bottom of which are drilled with holes about $\frac{1}{2}$ in. diam., and fitted with brass tubes about $\frac{3}{4}$ in. long. At a distance of about 6 in. below the tube a round piece of metal of just the size of the latter is supported so that the stream of water impinges upon it and breaks up in a surprising way. The water, indeed, leaves the disc in the form of a thin sheet. Consequently, cooling starts immediately. The question has been raised as to the efficiency of this scheme with water containing quantities of sulphate and carbonate of lime. Incrustations in the service launders and pipes of Rand cooling towers are serious in their effects.

Among the passengers on the ill-fated *Waratah*, which has now been missing at sea for over a month, is J. T. Carrick—a Rand geologist of high standing. Mr. Carrick has done a great deal of useful work in South Africa. Under his guidance the bore-holes of the Western Rand Estates were sunk, proving the probable extension of the Main Reef Series between Randfontein and Potchefstroom. His geological map of the West Rand is the standard compilation for this district.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Abbreviating Code Messages.

The Editor:

Sir—The telegraph companies' side of the message transmission and tariff question, discussed in your issue of August 21, was put very clearly to me this morning and it seems only fair that it should be made public.

"You should know," the manager told me, "that between important points there is what we call a 'bonus line'. The best operators only are employed for sending and receiving on this line. The minimum shifts' work is 350 messages per shift, after which each operator receives 1c. per message. Knowing this," he continued, "you will readily see that speed is the main thing. The receiving operator is not supposed to 'cut in', but to take it the best he can. Even at this time of the year when the aurora borealis adds and removes dots and dashes from the messages, the pressure of accumulated telegrams is too great to permit of stopping for corrections. From the time the operator 'sits in' at eight in the morning, not an instant is lost."

From this I gather that the greater the volume of business the greater the percentage of errors and naturally, the less the telegraph company is to blame. Poor company! Is there no way in which these interested can work together to take away from the lately merged Western Union-Postal company a part or all of its business, turning it over to the post-office? What should be the first step?

MARK R. LAMB.

Milwaukee, Wisconsin, September 25.

Turquoise.

The Editor:

Sir—On page 434 of your issue of September 25 you mention under the above headline some prices presumably paid for the various qualities of turquoise in the East. Being one of the largest buyers of turquoise in the East a few explanations from me in regard to its value may be welcome to some of your readers.

The sale of clear turquoise is limited, but a hard, deep blue material brings easily \$10 per lb. Turquoise matrix, however, has become a staple article with every jewelry manufacturer making a line of goods in which opaque and carbuncle cut stones are used. There is, therefore, constantly a good demand for turquoise matrix and its cutting and polishing is an established industry, the rough material being bought accordingly in large lots. There have been shipped, however, during the last 12 or 18 months considerable quantities of low-grade material, discolored, soft, or chalky turquoise with porous or otherwise undesirable matrix. Such material is a drug on the Eastern market and has no value at all. The lowest price for turquoise matrix, which, when

cut is a gem, may be set at from \$2 to \$3 per lb., according to the amount of waste. The chief requirements of a good grade of turquoise matrix are that the turquoise matter be of a clear, deep blue, and the matrix dark brown and as hard as the turquoise. If the matrix not only surrounds the blue turquoise matter but permeates it in all directions in vein or cobweb like fashion, the material will easily bring \$5 per lb., and miners having a good grade of turquoise matrix can sell the output of their mine on a contract plan. There is no longer any uncertainty as to large quantities finding a ready market. It must be remembered, however, that the Eastern trade desires only the very best material now, and if miners want good prices they should select their turquoise matrix carefully before shipping.

E. SCHAAF-REGELMAN.

New York, October 7.

Free Settlement Method of Separating Slimes.

The Editor:

Sir—In your issue of September 11 is an article by H. G. Nichols, under the above title, which I have read with great interest. The amount of moisture (27%) retained in the thick pulp removed from the bottom of the separator is certainly most satisfactory, and the apparatus, in this respect, compares favorably with the different types of vacuum filters. The subsequent procedure in dealing with this retained moisture does not, however, seem (at any rate theoretically), to be as good as the displacement method used in vacuum filter practice. This remark applies more especially to the cyanide loss incurred in cases where strong solutions are necessarily employed. The percentage of gold and silver recovery depends principally upon the ratio of solution to dry slime in the pulp fed to the separator, and the amount of weak solution used for washing down the pulp into the second separator. The percentage of cyanide loss is independent of the density of the pulp, provided the same initial strength is employed in every case. Let us assume the hypothetical case of a pulp consisting of 250 tons of solution to 100 tons of dry slime. Suppose that 400 grams of silver per ton of dry slime have been dissolved, and that the strength of the solution entering the separator is 3 lb. of KCN per ton; then the silver contained in each ton of solution will be $\frac{400}{2.50} = 160$ grams. Supposing the amount of moisture removed from the bottom of the separator to be 27%, then each 100 tons of dry slime will carry with it 37 tons of solution; and as each ton of solution contains 160 grams silver, the total amount of silver removed from separator No. 1 to separator No. 2 = $37 \times 160 = 5920$ grams. Now if three tons of weak solution are employed to wash down each ton of dry slime from No. 1 to No. 2 separator, there will be used for 100 tons of slime, 300 tons of such solution. This amount, plus the 37 tons of moisture, gives a total of 337 tons of solution. If the wash solution has been perfectly precipitated, the silver contents of the whole solution will be the 5920 grams above mentioned, or each ton will contain $\frac{5920}{337} = 17.567$ grams per ton. The amount of moisture contained in the pulp finally discharged will be, as before, 27%, or 37 tons per 100 tons of dry slime.

The ultimate silver loss is, therefore, $37 \times 17.57 = 650$ grams, which is equivalent to a recovery of 98.375% on the original total silver content of $100 \times 400 = 40,000$ grams.

Now, if the cyanide content is 3 lb. of KCN per ton of solution, the amount of KCN contained in the solution discharged as moisture from No. 1 separator will be $37 \times 3 = 111$ lb., and the amount of solution drawn off through the suction of No. 1 separator will be $250 - 37 = 213$ tons. But 250 tons of solution are required to maintain the volume of the strong solution for agitation purposes, therefore, 37 tons can be taken from the solution obtained from the suction of No. 2 separator. Now, No. 2 separator obtains 37 tons daily from the moisture introduced with the pulp from No. 1, and loses 37 tons daily in the form of moisture going out at its own discharge. It is plain then that the 37 tons withdrawn to replenish the solution drawn from No. 1 must be made up with water introduced into No. 2. Now, since the solution in No. 2 separator is composed of equal parts of solution from No. 1 and of water, it is clear that its strength must be one-half of that of the solution introduced from No. 1, or in other words, 1.50 lb. KCN per ton. It follows that the 37 tons taken from the suction of No. 2 to make up the volume of the strong solution, contain $37 \times 1.50 = 55.50$ lb. KCN, while the cyanide contained in the solution discharged as moisture in the pulp leaving No. 2 also amounts to 55.50 lb. The net loss of cyanide is, therefore, 55.50 lb. for each 100 tons of dry slime, or 0.555 lb. per ton. This amount, at 18c. per lb., represents a loss of 9.99, or practically 10c. per ton of slime handled.

It may be urged that the vacuum type of filters do not successfully displace the solution content of a cake during the process of washing, and on this point I am not in a position to speak authoritatively, but what I do wish to show is the fact that low moistures such as Mr. Nichols has obtained, though excellent in themselves, are not necessarily a guarantee of the very best work.

S. RIVERS BAILDON.

Pueblo, Colorado, October 1.

Geological Survey of India.

The Editor:

Sir—In view of the recent attacks made in the London *Mining Journal* on Mining Administration in India, and also both directly and indirectly on the Director of the Geological Survey, we have deemed it advisable to send you the following extracts, one of which is taken from the *Mining Journal* of June 26, 1909, page 801, and the other from the published evidence given by Sir Thomas Holland before the Royal Commission upon Decentralization and published in Blue-book Cd. 4369 (Vol. X of Minutes of Evidence, page 47):

From the *Mining Journal* of June 26, 1909, p. 801, leading article headed 'Mining Administration in British India'.

"We cannot close our observations on the evidence tendered to the Commission without noting the light thrown by the report on the sincerity of Sir Thomas Holland's attempt to suggest that we had imputed

corruption to Government officials in India. As an argument against the establishment of a separate Provincial Survey, the Director of the Geological Survey said: 'If I transferred an officer, say, to Burma, or any province beyond my control, and he was the officer who governed the granting of mining concessions, I have not the slightest doubt that within a year, if he had only ordinary intelligence, he would discover that his salary *would** be only a fraction of his income'. We do not remember even to have seen the chief of what is professedly a scientific body so frankly confess his distrust of his colleagues' honesty and professional pride".

Evidence of Sir Thomas Holland, Director, Geological Survey of India, published in Blue-book Cd. 4369, being Vol. X of the Minutes of Evidence taken before the Royal Commission upon Decentralization in India, p. 47:

Question No. 43,455: "Is not an officer who has to deal with mining concessions in any part of the world subject to great temptation?" "Yes; if I transferred an officer, say to Burma, or to any province beyond my control, and he was the officer who governed the granting of mining concessions, I have not the slightest doubt that within a year, if he had ordinary intelligence, he would discover that his salary *need** be only a fraction of his income".

By changing one word in quoting the Blue-book, the *Mining Journal* has altered the whole meaning of the remarks made by the Director. In view of the comments made, it is for the *Mining Journal* to prove that this misquotation is accidental. Having regard to the claim of the *Mining Journal* that it "circulates all over the world", the writer of the article must know that it will be read by many to whom the blue-books are not accessible, for no assistance has been given by a reference to the particular volume in which the Director's evidence is recorded. As the inaccurate quotation has already received a start of some weeks before reaching us in India, we shall be glad if, by publishing this letter, you will assist in preventing any further dissemination of a grossly unjust insinuation.

With this sample before them, we can safely leave your readers to estimate the value of the attacks on the Indian administration recently made in the *Mining Journal*. Needless to add, the relation between us and Sir Thomas Holland is one of perfect and mutual confidence. We have been unable to communicate with three of our colleagues, who are at present absent in the field, but we are convinced that if they had the opportunity they would join with us in appending their signatures to this letter.

T. D. LaTouche, H. H. Hayden, P. N. Datta, E. Vredenburg, L. L. Fermor, G. E. Pilgrim, G. H. Tipper, H. Walker, K. A. K. Hallows, G. de P. Cotter, J. J. A. Page, H. C. Jones, A. M. Heron, M. Stuart, N. D. Daru, W. A. K. Christie.

Geological Survey, Calcutta, India.

The tunnel through the Andes on the line of railway between Valparaiso and Buenos Aires is progressing rapidly, and at the present rate will be completed before the end of the present year.

(*The italics are ours.)

DRILLING IN ALLUVIAL GROUND IN ALASKA.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

At Nome the use of the drill in prospecting is fully appreciated; in fact, drills have been used more generously than wisely in many instances. Drilling, like sampling, can be done so carelessly as to be worse than useless. That describes some of the results of expensive work on the Seward Peninsula. The old blunder of taking the arithmetical average of assays without regard to the width of ore sampled at different places has been duplicated by the averaging of the yields from bore-holes without reference to the varying depth. Thus, a yield of 80c. per yd. from a 30-ft. hole has been averaged with the 20c. from a 70-ft. hole, giving $20 + 80$ divided by 2 as the result, or 50c. per cu. yd. If the geometric mean be taken, with an eye to the fact that one hole is more than twice as deep as the other, the true average is obtained. In this case it is 38 cents.

A Keystone drill that is worth \$1300 f.o.b. at Beaver Falls, Pennsylvania, with proper allowance for wearing parts, will cost \$2400 at Nome. There are fully 25 of these machines on the Seward Peninsula. On Ophir creek, at the upper line of Claim No. 2, I saw a hole started by a Keystone No. 3 machine. The casing was first pushed by a driving clamp for $3\frac{1}{2}$ ft. into the creek-sand, striking some gravel at the bottom. Then the clamp was raised and about 5 gal. water was poured into the casing, preparatory to commencement of the drilling.

Drilling can proceed even in winter. The Keystone drill employed on lower Thanksgiving creek, in the Hot Springs district, not far from Fairbanks, was in use up to January 1, 1908, and was started again at the end of February; thus the drill was idle only two months. The drill is combined with a traction engine and either can be thrown into gear. The machine is easily moved after the holes are drilled; in soft ground an extemporized track is made by laying down a couple of 4-in. poles; in winter a $\frac{1}{2}$ -in. angle-iron 2 in. wide is affixed across the tire of the rear or drive wheels. The tires are 16 in. wide. The front wheels are 10 in. wide and in the centre of the tire there is a rib projecting one inch. In summer the crew consists of three men; in winter, four are needed, the extra man being engaged in hauling ice or water for the boiler. When I saw the drill in operation, the foreman was getting \$8 per day; the panner, \$6; and the fireman, \$5. In each case \$3 must be added for board. The fireman helps the foreman in sharpening tools, handling the sand-pump, and so forth. A 6-in. casing is used. Only extra heavy casing should be used in the North. The casing is driven only a length (5 ft.) or two from the surface, the remainder of the hole being in frozen ground, requiring no casing. Speaking generally, it is advisable to use a casing for the entire depth of hole, because the varying proportion of ice may cause the formation of a pot-hole. If the ground is thawed deeply, a casing is inserted all the way. At times in summer the surface water is warm enough to thaw the frozen ground and the sides of the bore slough so as to spoil the sampling. The remedy is to use a casing all the way

down. As the hole is made, the débris is pumped. The sand-pump is a hollow cylinder, 8 ft. long and $4\frac{1}{2}$ ft. diam., equipped with a plunger and valve. The plunger is raised rapidly to create a vacuum and suck the stuff at the bottom of the hole into the tube, which is then lifted and emptied into a wooden tank. From this it is taken by the panner, a man whose duty it is to wash the products of drilling. He does it with an ordinary pan, saving the gold concentrate extracted from the sample obtained at each successive stage of the drilling. This gold is subsequently dried, blown clean, and weighed.* It is well to wash the bedrock separately. The driving-shoe, which forces the drill into the ground, is $7\frac{5}{8}$ in. diam. The casing is pounded by the driving-clamp attached to the drill-stem. A good operator will be careful not to injure the threads on the casing and will use graphite or oil to lubricate. Such an operator was Bernard Estoy, the foreman in charge on Thanksgiving creek in August 1908. He drilled 40 holes, averaging 25 ft. each; at a cost of \$1.01 per ft., including all costs and break-downs. This was in the heart of the northern wilderness.

To A. V. Thorns, manager for F. G. Manley, I am indebted for the following details concerning the cost of operating a No. 3 traction Keystone drill in the Hot Springs district, from February 10 to September 21, 1908. The total cost for labor and supplies, including all repairs, moving drill eight miles, hauling wood and water during the cold months, was \$8419.25.

| | |
|--|-----------|
| Total drilled | 9054 ft. |
| Average cost per foot..... | 93c. |
| Average depth of holes..... | 20.64 ft. |
| Average cost per hole..... | \$19.22 |
| Average distance drilled per day, including repairs and moving. | 49.5 ft. |
| Deepest holes | 115 ft. |
| Shallowest holes | 10 ft. |

The ground drilled consisted of frozen clay, gravel, and angular rock. Frequently in the months of February and March, the drill was in operation during severe weather, as cold as 40° below zero, with $3\frac{1}{2}$ ft. of snow on the level. The driller received \$8 per day and board; the helper, \$6; the panner, \$6 also; and the extra man \$5 per day, with board. The three men first mentioned were employed steadily; during the winter months the extra man is required all the time and during the summer he is employed part of the time.

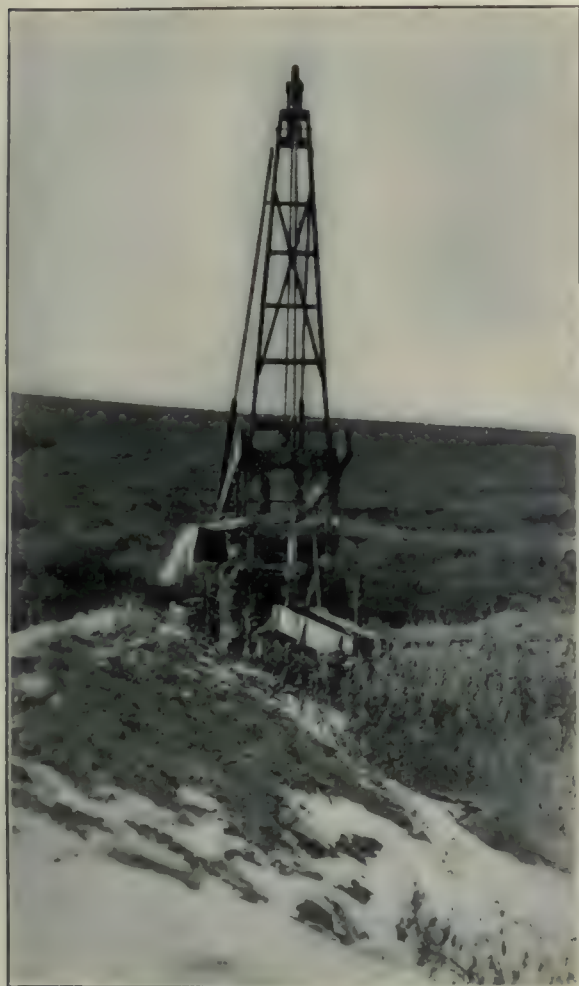
These costs are exceptionally low and should be taken as indicating what can be done under the most favorable conditions, not as an average likely to be attained by a newcomer. At Nome drilling in frozen ground, without a casing, has averaged \$1.50, but on the whole the total cost of drilling, with casing, is nearer to \$3 than to \$1 per foot in Alaska.

It is advantageous to use the drill for testing purposes during the winter, but the results are apt to suffer in accuracy owing to the difficulty of panning. On Thanksgiving creek the equipment included an 8 by 10 ft. portable tent on poles and a Yukon stove

*A small portable balance made by H. Kohlbusch, of New York, is widely used for this purpose.

laid on two poles across the floor of the tent, so that the stove was moved with the tent. Water was heated by steam coming from the boiler, the panning-tub being placed on the stove. The small quantity of water and the re-use makes it muddy, hindering the panning. An extra man is employed to bring in fuel and ice.

A. L. Hamilton, of Fairbanks, stated to me that in drilling with a No. 3 Keystone he got live water in every case by penetrating 12 to 15 ft. into the bedrock. In frozen muck he has made 135 ft. in 11 hours. On Dome creek, at No. 11 Below, a shaft was sunk 148 ft. and ooze or mud rose from the bottom filling it for 75 ft. On No. 7 Below also 'heaving' bedrock



Keystone Drill at Work on Ophir Creek.

was struck, rendering it impossible to operate; the timbers were sheared and the drift warped. The prospecting drill is most serviceable in enabling operators to obtain, at small expense, the information that they should possess before they go to the larger expenditure involved in shaft-sinking.

It is a common practice to thaw ahead of the drill. For this purpose a 'steam-point' 5 ft. long is used, with pipe that can be lengthened. The 'point' is dropped down the hole and left there for not more than five minutes; a longer interval will make the bore larger than the casing.

Looking at the coarse gold lying on the bedrock of many of the Alaskan diggings, the question arises whether the pump could suck such heavy particles from the bottom of the hole. Yes; pieces of gold weighing an ounce have been raised. It depends

upon the particles finding their way to the centre of the bore. However, the chief use of a drill is not only as a sampling device, but to ascertain the depth to bedrock and the character of the deposit, especially to find out whether the ground is frozen or thawed. When the drill is intended to yield samples of the ground, it is imperative that the hole be cased for its entire depth.

The testing of ground by drilling for a purchasing company should not be directed by the promoter or the owner, but by a representative of the purchaser. That is the A. B. C. of serious prospecting, but it has been disregarded. Next, the drilling should be done under the charge of an experienced man, not a carpenter or an electrician who never saw a drill before. This also is a simple idea not often put into practice. Finally, having drilled carefully and honestly, the record must be kept systematically and platted on a map accurately. If not, the results will be confused and misleading.

DETERMINATION OF SILICA.

A method for estimating silica in ores, endorsed by the United States Steel Corporation, is as follows: one gram of the sample is transferred to a porcelain dish, or a beaker, with watch-glass cover, and 20 c.c. of strong hydrochloric acid added. A gentle heat is applied until the ore is dissolved, and the solution is then evaporated to dryness, unless it has been conclusively shown to be unnecessary. To the residue, which should not be heated above 120° C., 15 c.c. of dilute hydrochloric acid (1 part acid to 1 part water) are added, heat is applied until the salts are dissolved, and the solution is diluted with hot water. The precipitate is filtered off, washed, ignited at the highest temperature of the blast-lamp or muffle-furnace for at least five minutes, cooled, and weighed. To the residue in the crucible one or two drops of strong sulphuric and 5 c.c. of hydrofluoric acids are added, and the solution is evaporated to the expulsion of sulphuric acid. The residue is ignited as before and again weighed; the difference between the two weights is silica.

Free timber to the amount of nearly 7,000,000 bd. ft. was given away for domestic use of people in the California National Forest district last year. F. E. Olmsted has just compiled a statement showing that the exact amount given away was 6,885,287 ft. board measure, having an estimated value of \$14,262.20. The Forest Service grants free timber to the value of \$20, based on its value standing in the woods, to settlers, farmers, prospectors, and others for domestic use, and to school and road districts. This free use is confined to those who need it for domestic purposes. It is not given away for any kind of commercial use.

Coke production during the four weeks in August in the Connellsville district, was 1,605,185 tons, more than double the product for the corresponding weeks in 1908. The pig-iron production for the month, 2,246,480 gross tons, approximates the record production of August 1907, the output of the Pittsburg district for the past month even exceeding the August 1907 output.

PROTECTING STEEL FROM CORROSION.

By R. B. WOODWORTH.

*The use of steel in coal mining operations has been objected to on the ground of the presence of acid found in the waters. This condition obtains also, and probably to a larger extent in the copper mines, and in iron mines carrying pyrites. Such steel as has already been installed in the mines of the United States has given satisfaction without any serious corrosion, and without any protective treatment of the steel other than the use of good preservative paint. In wet mines in England steel girders are frequently tarred before being put in, but the actual loss from corrosion is so small as to be a minor quantity, even when the steel is not painted. In dry mines there is not much danger of any serious corrosion, but in conditions subject to moisture, and to varying temperatures, attention must be paid to this point. In my opinion true economy will be found in the painting of all steel for underground mine operations with one shop-coat of good paint and with at least one field coat. If these are well worked in the steel should need no further attention for years.

Careful investigation has been made as to the kind of paint which may be depended on for service in contact with acid waters, and I have conducted laboratory experiments to demonstrate the fitness of different pigments for this purpose. I agree with the conclusion reached by A. S. Cushman, of the Scientific Section of the Paint Manufacturers Association of America, that steel should not be painted with carbon paints in the manufacture of which sulphuric acid has been used, and the use of coal-tar products is therefore to be avoided. The natural carbons, such as graphite, and hydro-carbons, such as asphalt and gilsonite, may be recommended for the second-coat work if properly ground and mixed with a good vehicle. For the first coat, pigments should be used of an inhibitive character. The oxides of iron, such as Venetian reds, are usually manufactured by chemical processes, and their use is to be avoided, though a good natural oxide of iron paint may be used under dry atmospheric conditions. For first-coat work zinc chromates should give good service, but probably the best to use is red lead and oil, which has been demonstrated to be a first-class pigment for preservative treatment in most situations. The red lead should be pure and mixed in the proportion of not less than 15 to 16 lb. of red lead per gallon of oil. The oil should be pure, and in my judgment raw oil is better than boiled. The matter of vehicle is of some importance, and care should be taken to see that the pigment is thoroughly mixed before application. Red lead is a heavy pigment and settles quickly, necessitating the mixing of a new lot if it has stood any length of time. The settling may be retarded by the use of barytes or 'asbestine', and the use of the latter is to be recommended by reason of its permitting a firm hold on the pores of the steel. For first-coat work, therefore, a mixture of red lead, oil, and asbestine, in the proportion of at least 15 lb. of red lead and 2 lb. of

asbestine per gallon of oil, with sufficient japan dryer to work well, may be recommended as probably the best which can be had under present conditions; and for the second coat either silica-graphite or Mexican graphite; both coats to be well worked in, and the first coat be thoroughly dry before the application of the second. The theory on which this preservative treatment is recommended is based on the use of a practically inhibitive pigment to prevent the inception of corrosion in the steel, and the use of a second coat to protect the first atmospheric and temperature conditions, and to fill up thoroughly any vacancies or voids which may occur in the first. Inasmuch as the particles of the red lead and the graphite are extremely small, the combination of these two coats should give a film practically impervious to atmospheric moisture, or to acid-bearing waters.

We live in an age of steel. The large demands made on our timber resources and the increasing scarcity of timber suitable for the heavier constructions of underground mine-work, make the consideration of a substitute a matter of vital moment. Experience in varied lines of construction has shown steel to be the one material known in the engineering world which by its flexibility and convenience of use can replace wood fully and satisfactorily. It can be perfectly adapted to all phases of construction; it is easy to obtain and convenient to fabricate and erect, and its long life under all conditions of moisture temperature, and stress amply compensates for the increased cost of its first installation. Reduction in weight, economy in erection, the possibility of re-use, and its fire-proof character, are but a few elements of advantage. The application of steel to mine timbering is but in its infancy. Considerations of economical operation will necessitate larger use of steel in the future, and the mine owner will be wise who looks beyond present first cost to ultimate economical operation and steady uninterrupted returns on investment.

Aluminum is used in iron and steel works for removing oxygen from the oxides of iron and other substances, the heat generated being so great as to raise the temperature of large bodies of iron. It also has the power of combining chemically with the gases imprisoned during the cooling of the metal, thus preventing porosity. For these purposes the metal is either used in the form of an alloy known as 'ferro-aluminum', or as the pure metal, either in the granulated or bar form or in small pieces weighing uniformly one-eighth ounce or one-fourth ounce each. This property of keeping molten metal hot or of raising the temperature of a molten metallic bath has been utilized in the thermit welding process, invented by Goldschmidt. In this process aluminum and iron oxide are intimately mixed in a finely divided state and ignited by means of a fuse. The heat of combustion in the ensuing reaction raises the temperature of the casting to the welding point. The reaction takes place in a funnel-shaped crucible, from which the fluid metal resulting from the reaction is run into a suitably shaped mold formed around the area of the joint to be made, which is pre-heated by means of a blow-lamp to avoid chilling the first lot of metal coming through.

*Abstract from paper on 'Application of Steel to Mine Timbering', presented at the American Mining Congress, Goldfield, Nevada.

QUICKSILVER AT HUANCAMELICA, PERU.

Written for the MINING AND SCIENTIFIC PRESS
By LESTER W. STRAUSS.

The town of Huancavelica is situated in Lat. S. 12° 54' and Long. W. 75° 4' (Greenwich), on the eastern slope of the western Cordillera of the Andes, and is the capital of the Department of that name in the Republic of Peru. It is accessible either from Pisco, a port on the coast one day by steamer south of Callao, and then five days on horseback (including half a day railroad ride from Pisco to Ica), the last part of the trip being over the Cordilleras; or from Callao, taking the Peruvian Central railroad to Huancayo—a day and a half ride—and then two days on horseback, four days being necessary. The latter route is preferable, the former having been used prior to the time when the railroad reached Huancayo. Huancavelica is in a narrow gorge through which passes the river of the same name, and is surrounded by high mountains. The altitude of the town is 3740 metres (12,267 ft.) above sea-level, while the mines are at 4250 to 4390 metres. The climate is healthy but usually rainy, with hail and snow during the winter months (November to May), and the nights are cool and refreshing. The population may be 3000. The industries are agriculture, the raising of llamas, alpacas, and cattle, and mining; the last being at present conducted on a small scale.

The opening of the quicksilver deposits resulted, according to history current in Huancavelica, upon a trip of an archbishop who was traveling eastward to Ayacucho in 1532. Stopping for the night in an Indian's hut, he was offered 'silver-water' to wash with. Recognizing native mercury, his questions led to the Indian's showing numerous 'wells' which interested the archbishop, who sent specimens of cinnabar and native mercury to Spain. The Spanish Crown immediately took steps to develop the industry, which began production January 1, 1571. Mariano Eduardo de Rivero y Ustariz, in Vol. II, 'Colección de Memorias Científicas' (published in 1857), states that an Indian advised Amador Cabrera, in 1564, of the quicksilver ores, and the latter sold the Santa Barbara mine, in 1570, to the King of Spain for 250,000 ducados. It is certain, however, that Viceroy Francisco de Toledo, who reached Lima in 1569, and later became "distinguished in founding the infamous colonial system", claimed all the mines for the Spanish Crown, allowing some rights to the discoverers and their descendants. At times the mines were worked for the Crown, and in other periods by the 'Gremios de Mineros' (a sort of Miners' Guild or Union which existed in each mining district and had an exclusive monopoly in making its own laws, each being suited to the conditions prevailing in the particular region), who were obligated to sell their product, either weekly or monthly output, at a price varying from 50 to 85 pesos per quintal. This resulted in a profit for the Crown, and a loss to the 'Gremios'. This body was poorly organized, and the members mined unsystematically, extracting rich ore, robbing pillars, and filling up abandoned workings, so that the mines were left mainly a mass of holes, with some extensive openings,

which resulted later in rendering the workings dangerous. In one of the workings a collapse buried 100 Indians. From 1790 to 1813 the mines were worked by the Government. Previous to, and for some years after, the independence of Peru (July, 1821), no work was done. In 1836 a company was formed to produce sufficient metal for consumption in Peru, but was dissolved in 1839, and later poorly re-organized, so that in two years' time it failed, after ruthlessly gutting the workings. Later the properties were rented by the Government. Lack of sufficient capital and of efficient management, as well as the discovery of mercury in California, coupled with political strife in the country, were the causes for the decadence of the industry.

In 1784 work, under the director Pusterla, was begun in San Juan de Dios, exploring the zone in various directions. It was noted that the mineral here



Map of Central Peru.

occurred in bunches, and that below the tunnel Señora de la Bélen, in the deeper part of the hill, there was good mineral. He was of the opinion that work to the south on the zone would be preferable to the north. Rivero gives an extract of a report, made in 1785, which stated that the entire zone is metalliferous, with cinnabar more abundant in one part than in another, and in places, where the mineralization is narrow, the ore appears more abundant than in the wider parts. In 1790 Baron Nordenflicht writes that the Santa Barbara workings are stated to show the zone to be 80 varas (50.4 metres) wide, striking N. N. E., the sandstone appearing both fine-grained and coarse-grained, spattered with cinnabar. Rivero describes his entrance into the workings in 1846, through the tunnel, Señora de la Belén. After a description of the drifts, winzes, and stopes entered, he states the zone to be 50 varas (41.5 metres) wide, carrying cinnabar disseminated in the sandstone. In the region of the workings known as Carlos III, he found cinnabar in the sandstone with

walls of white limestone and bluish marl, the width of the mineralization being from 40 to 50 varas (33.2 to 41.5 metres). The workings show enormous stopes, and figures prove that from 1690 to 1722, 1,447,845 pesos were spent in labor and materials to support the walls, and other workings. In summing up his study, Rivero states that the zone (he calls it 'man-to') varies between 70 to 80 varas (58.8 to 67.2 metres) containing approximately 1% mercury on an average.

During the rule of Spain the provinces were made to contribute to the support of the mines, either in sending money or Indians (mitayos). These unfortunates were practically slaves. The contributions per year amounted to 40,000 pesos and 165 Indians. In 1846, 46 mines were producing, the ore being smelted in 111 furnaces. The Trinidad and Quirar-quichqui mines yielded ore which gave 40 to 45 lb. of mercury per furnace-run, that is, 1.3 tons of coarse and fine ore.

According to the books kept for the Spanish Crown, the production of quicksilver from 1571 to 1790 inclusive (220 years), amounted to 104,046,931 lb., which, valued at 0.73 peso per pound, makes a total value of 75,954,257 pesos. From 1791 to 1813 inclusive (23 years), 6,976,610 lb. were produced. No detailed records are obtainable for the producing periods from 1836 to 1839, but Rivero states that 120,000 lb. were probably produced yearly. The periods 1814 to 1835, inclusive, were non-producing, due to internal friction which led to the independence of Peru in 1821, and the following years were occupied in establishing the republic. From 1839 up to the present, no data exist, but it is probable that 1,000,000 lb. would be approximately the production. The total amount of mercury won has been:

| | Pounds. |
|------------------------------|-------------|
| 1571 to 1790 inclusive..... | 104,046,931 |
| 1791 to 1813 inclusive..... | 6,976,610 |
| 1836 to 1839 inclusive..... | 360,000 |
| 1840 to 1909, estimated..... | 1,000,000 |
| Total | 112,382,541 |

The above does not include the mercury stolen.

It is interesting to note that the silver mines in Peru required 563,100 lb. of mercury yearly in the production of 562,000 marcos (4,496,000 oz.) of silver, indicating a loss of 1 lb. per marco, or 2 oz. mercury per ounce of silver. The figures given represent the years 1800 to 1804 inclusive.

The cinnabar belt is said to be about 60 kilometres long, in a northwest and southeast direction. The production, as given above, has come from the Santa Barbara mines (southeast 2.7 kilometres from Huan-cavelica), occupying a small part of the entire area; here the mineral has appeared in workable quantities, probably due to the close proximity to the basalt, which appears immediately to the west. The mineralization is intimately associated with sandstone, limestone, and calcareous conglomerate, which have suffered folding, due, no doubt, to the later eruptives—basalt, porphyry, and andesite. The cinnabar in the Santa Barbara mines, which are the workings referred to throughout this article—appears to have impregnated the sandstone, also occurring as bunches in the same, and as veinlets in the fractures and cavi-

ties in the limestone, and less frequently in the conglomerate. The ore is sometimes found as a powder bespattering the gangue rocks. With the cinnabar and native mercury are associated galena, blende, pyrite, arsenopyrite, and realgar in small amounts. The principal distribution of the cinnabar is in the sandstone. Picked samples of ore run up to 10% of mercury. According to Umlauff (Boletín del Cuerpo de Ingenieros de Minas del Perú, No. 7, published July 1903), the average assay of the samples taken from the workings already exploited, showing mineralization, not from the mass of sandstone and limestone in which the mineral is impregnated, gave 2% mercury. The nature of the mineralization is such as to cause one to expect irregular distribution of the ore throughout the zone. Its deposition was affected by the character of the rock. In the sandstone it occurs in the minute cavities between the grains, and in the white limestone following the joint planes or cleavage, or depositing on the walls of the cavities in the same. The limestone contains Cretaceous fossils. The andesite, which occurs in masses of irregular size through the sedimentary rocks, is barren of cinnabar. Mercury-bearing sandstones or limestones frequently surround these masses, which, on account of their imperviousness, blocked the passage of the mineral solutions, thereby causing deposition.

The origin of the ore is undoubtedly due to thermal action. It is apparent that the sandstone afforded a channel for the passage of the solutions, and from it they extended to the limestones. The intrusion of the basalt was the cause for the circulation of the thermal solutions which produced the ore and the springs. It is conceivable that the cinnabar may have been precipitated from solution by reduction of pressure and temperature in its upward course; also through chemical action, in the oxidation of the H₂S gases and the reactions of the alkaline salts in warm, diluted solutions. The native mercury is probably the result of the chemical activity of acid waters upon the cinnabar. There are several springs close to the town where the temperature is usually 82°F. The deposition of calcium carbonate and oxide of iron is continual, and in places the deposit attains a thickness of 8.5 to 10 metres. The water emits a sulphurous odor. Raymondi gives an analysis of the water from the San Cristóbal spring, on the north side of the town.

| ONE LITRE OF WATER ANALYZED. | |
|--|---------|
| | Grains. |
| Carbonate of lime..... | 0.0750 |
| Carbonate of magnesium..... | 0.0250 |
| Oxide of iron..... | 0.0025 |
| Sulphate of lime..... | 0.3128 |
| Sulphate of magnesium..... | 0.0756 |
| Chloride of sodium..... | 0.2642 |
| Chloride of magnesium..... | 0.1177 |
| Potassium and lithium... appreciable amounts | |
| Total | 0.8728 |

The tunnel 'Nuestra Señora de Belén' is 560 metres long, about 120 metres below the crest of the hill; its cross-section is 3 metres wide, and from 2½ to 3½ metres high, being accessible part way on horse-back. Its direction is N. 25° E., and about 286 metres from the portal a cave prevents further entry. This tun-

nel was commenced in 1601, and finished in 1642: it passes through schist, conglomerate, limestone, slate, calcareous slate, limestone, and sandstone. Its driving cost the miner's guild 1,000,000 pesos. Several rich shoots were cut in passing through the mineralization in the sandstone; the face is said to have been driven 100 metres beyond the sandstone, where realgar appeared in considerable amounts. It is stated that the work done is within an area of 60,000 square metres, but no statement is made as to the tonnage this might represent; the average depth worked out might be 150 metres. The deepest workings are 450 metres below the crest of the hill, and about 200 metres above Ulloa, or Poccho tunnel. This tunnel, situated 400 metres southeast of the centre of the town, and 32 metres above it, was selected as a feasible place for driving to cut the mineral in depth. About 2000 metres of driving were estimated as necessary before reaching the zone at a depth of 500 metres before the Nuestra Señora de Belén. It has been driven 150 metres in slate, with sandstone close to the walls. A little sulphurous gas is noticeable. Unfortunately the mine workings, particularly in depth, are not all accessible, owing to the ruthless system of mining done by the 'Gremios de Mineros'. The mines and their output would have been much better had their exploitation been in the hands of strong capital and efficient management. There exists in the National Museum in Lima a plan of the workings.

The furnace used to smelt the ores, both fine and coarse, was invented by Lopez de Saavedra Barba, in 1633. Previous to this the ores were treated in earthenware bowls or trays, which crude process was succeeded by a type of furnace called 'javecas'. Details of these processes are not given, but the production of mercury, during the 62 years that the ores were smelted by these inferior methods, that is, from 1571 to 1632 inclusive, amounted to 31,764,170 lb. The Barba furnace was improved by José A. Bustamente at Almadén, Spain, in 1646, and is in use there at the present time. These improvements consisted in making the furnace larger, widening the openings leading to the aludels, and passing the vapors through large chambers after having been condensed in the aludels. From the aludels the mercury passes to pans, and is finally collected in cast-iron pans in a storehouse. Brushwood was used as fuel, but is now superseded by coal. The furnaces used at Huancavelica were poorly constructed, the stones being porous, the joints loosely plastered over with mud, and the junctions of the condensing-tubes and aludels poorly luted. These defects caused considerable losses in the escape of the mercurial vapors; metallic mercury collected in the crevices of the stones, in the adobe, or mud walls, and luting, and in the straw-roofs housing the furnaces. The escape of mercurial vapors usually sickened the furnacemen. The improved furnace used in Almadén would have lessened the losses and defects. The scarcity of wood accounts for the use of straw and llama-dung and a necessarily smaller furnace to concentrate the heat. The poor quality of fuel burned resulted in part of the cinnabar failing to be decomposed. The furnaces, usually built in blocks of two, were charged

as follows: above the grate or adobe arch, extending over the fire-box, a layer of previously smelted ore was spread, upon which followed a layer of low-grade coarse ore, succeeded by two or three layers of 'bolas', small cakes about 6 in. diam. and 1 in. thick, made of fine ore mixed with mud, so placed as to allow openings for the passage of the heated gases. A tube was suspended in the centre about which low-grade coarse ore was spread, a second tube was placed over the first, and high-grade, coarse ore spread about it, followed by a row of bolas, then by low and high-grade ore, in alternate layers, finishing with fine ore until the furnace was filled to below the openings or tubes leading off to the aludels. Care was taken, throughout the charging, that proper openings were left for the passage of the heated gases. Charging having been completed, the mouth of the furnace was closed. At the present time the charging is done somewhat differently. The bolas are placed on the grates so as to allow for 1-in. openings, and above these coarse ore, 4 to 5 in. diam., is spread, each succeeding layer being made up of smaller material until at the top of the charge the lumps are $\frac{3}{4}$ to 1 in. diam. No tubes are used inside of the furnace. In front of each tube, there being four, each 6 in. diam. and 4.5 ft. long leading off from the furnace top, were a series of bowls or aludels, made of clay 16 to 20 in. long 10 to 15 in. diam. at the widest part, and 5 to 6 in. at the extremities, 14 to 16 in a row, which served to condense the mercurial vapors, the last bowl opening into the air. The operation of charging, distilling, and discharging the treated ore took about 24 hours, of which 10 hours was believed to be the necessary time-allowance for distillation. The amount of coarse and fine ore smelted consisted of 15 cajones, each weighing from 6 to 8 arrobas, 150 to 200 lb., a total of 1.31 tons. Including the bolas, the total charge was 50 quintals (2.5 tons, as 500 bolas were used per charge, and a bola weighs from 4 to 5 lb.). About 1.7 to 2.0 'piaras' of straw (about 3.4 to 4.0 tons) were consumed per charge; at present 300 lb. of llama-dung and 100 lb. of straw are required per charge. A 'piara' consisted of a drove of 40 llamas, each carrying a carga of 100 lb. After closing the furnace top, the straw-fire was started, having allowed openings for the escape of the moisture from the ore, which usually required 3 to 5 hours, according to the carefulness of the 'oyarico', that is, furnace foreman, the amount of moisture, and the condition of the fuel. The furnace help usually inserted a hand in one of the openings referred to, to judge the completeness of the calcining. The smelting, or distilling of the ore was judged through these openings, which also served as draft. They were temporarily closed with mud-balls. The aludels helped to give some idea as to how the heat was passing through the furnace, which test was made by inserting the hand to judge the temperature. When it was estimated that the fire had reached the ore, the door of the fire-box was closed with mud and the enclosed fuel allowed to burn out. The escaping gases, from the fire, passed out through the outlet-tubes and aludels, which latter were placed over tubes of water that served to cool them. After having thus retarded the fire, a wet cloth, tied to a

rope, was used to moisten the top of the first aludel connected with the outlet-tubes. This wetting down was continued until it appeared that no mercury was being volatilized, which observation was made through peep-holes, as well as tested. This test is described later. The top of the furnace was then opened, and also the discharge-holes above the grate, thus cooling the furnace; the mercury was collected according to the amount apparently deposited. This was usually done after every two charges. The interior of the furnace was sprinkled with water, after which the chargers entered to begin the succeeding run. A monthly report for November 27 to December 31, 1791, shows the following figures:

| | | |
|-----------------------------|----------------|---------------|
| Coarse ore treated..... | 10,852 cajones | } 2540.6 tons |
| Fine ore treated..... | 23,023 cajones | |
| Straw consumed | 2,179 piaras | = 4358 tons |
| Charges smelted | 1,287 | |
| Mercury produced | 18,118 lb. | |
| Mercury produced per charge | 14 lb. | |

| COSTS DURING THIS PERIOD. | | | |
|------------------------------------|--------|---------|-----------------|
| | Pesos. | Reales. | Pesos, per ton. |
| Handling waste and building pack- | | | |
| walls | 2,172 | 5 | 0.86 |
| Extracting coarse ore..... | 4,796 | 7½ | 1.89 |
| Transporting ore from mine to | | | |
| furnaces | 3,423 | 4¼ | 1.35 |
| Straw and supplies..... | 1,978 | 1¾ | 0.80 |
| Repairing furnaces | 3,740 | 1 | 1.47 |
| Salaries of staff..... | 1,015 | 4½ | 0.40 |
| Rent of furnaces..... | 200 | ... | ... |
| One-half of freight on 500 quin- | | | |
| tales of mercury to Pasco (near | | | |
| Cerro de Pasco)..... | 1,125 | ... | ... |
| Carrying office correspondence.... | 38 | 5½ | 0.03 |
| Buying mercury | 102 | 1 | ... |
| Salaries of German mineralogists. | 475 | ... | 0.19 |
| Total | 19,112 | 6½ | *6.99 |

*Cost based on tons smelted per month, considering only operating costs. These figures are not in the report as given. The ton of 2000 lb. has been used. No mention is made of the number of furnaces.

Operating costs per quintal of mercury produced was 98.02 pesos.

The costs of production for the year 1791 are:

| | Tons. |
|---------------------------------|---------------------------|
| Coarse ore treated..... | 143,732 cajones=10,779.9 |
| Fine ore treated..... | 206,661 cajones=15,499.55 |
| Straw consumed | 22,545 piaras=45,090.00 |
| Charges smelted | 11,372 |
| Mercury produced | 178,768 lb. |
| Mercury produced per charge. | 15.72 lb. |
| (Per ton coarse and fine ore) | 6.80 lb. |
| Pesos. | |
| Total costs for the year..... | 210,211 |
| Total value of the production. | 130,500 |
| Cost per quintal of mercury... | 117.6 |
| Value of quintal of mercury... | 73.0 |
| Cost per ton of ore treated.... | 8.00 |
| Value of ton of ore treated.... | 4.97 |

The 13 smelteries in the vicinity of the town were each under the supervision of a mayordomo, general foreman, who lived at the plant and looked after the furnace-operation in all its details. The 13 smelteries were divided into three departments, each in charge of an overseer whose duties were to note material received and consumed, to watch the cleaning up of the mercury, and to accompany it to the Royal Stores. There was also an inspector who watched the dis-

patch of the coarse and fine ore to the furnaces, noting its quality; received the straw, and so forth. Above all was a director or general manager, who rendered daily accounts of all materials received and consumed, inspected the quality of the ore being treated, assisted in the weekly weighing of the mercury produced, and the like. Each furnace was in charge of a head Indian, whose pay amounted to 4 reales (about 50 centavos) per day. He watched the charging and running of the furnace. The 'oyarico', a free Indian as compared to the 'mitayos', contributed by the various provinces, charged the furnace, taking care as to the proper distribution of the material. He watched the running of the furnace, also urging the furnace-men and peones. The pay was 4 reales (50 centavos) per furnace run. Each 'hornada' (smelt) was made by the 'mitayos', who separated and picked over the discarded ore after a smelt, charged and discharged the furnace, supplied fuel to the fire, and attended to all the necessary manual labor. They worked day and night, receiving 3 reales (37½ centavos) per smelt, that is, 24 hours. Their women helped them, particularly in washing the mercury. A bachelor paid ½ real (6¼ centavos) to a woman who worked with him. The women made the 'bolas', receiving 3 reales for 500.

In running the furnaces many difficulties were experienced with the labor. During the cold nights the men would fall asleep, permitting the fires to go out, thereby cooling the furnace. Upon awakening, they would discharge the furnace and blame the low recovery to the poor grade of the ore. Evaporation of mercury often occurred through carelessness in luting the top of the furnace, or in failing to close the peep-holes when not in use. In testing whether the last of the mercury had been distilled, a stick, coated with mud, was inserted in one of the peep-holes, and after a few minutes withdrawn. If it did not appear whitened with mercury pellets, the process was considered finished; as this test was often done at night, by candlelight or moonlight, the results were not reliable. Furthermore, the men would be half asleep at their work, and would gladly favor discontinuing the firing so as to be able to quit work early. The laborers suited the operations to their own convenience, particularly on night work. Means were taken to reduce this shiftlessness at night by having a special furnace-man pass from furnace to furnace testing the distillation. When it was decided that no more mercury was being distilled, the furnace-top was opened, and within an hour the aludels were separated, provided enough mercury had been collected, and each was washed over a tub to loosen the mercury clinging to the sides. The dirty material caught was afterward mixed in the 'bolas'. This was the only use made of a very small part of the soot or 'stupp'. Below the bowls, or aludels, the earth was cleaned up to collect any mercury which might have escaped. Certain losses were unavoidable here as well as in handling the mercury. The furnace is about 4 metres high from the floor to the mouth, and 4 metres square. The interior is conical in shape being 2 metres in diameter over the arch, and tapering to 50 centimetres at the mouth. There is about a metre of wall enclosing the charge. The

two discharge doors are 20 centimetres above the arch, thus permitting easy removal of the smelted ore; the outlet-tubes, leading off to the aludels, are 30 centimetres above the arch. The fire-box is 15 metres in diameter and 75 centimetres high; the opening is 50 centimetres wide. There are usually four arches, made of adobe, spanning the fire-box. The top and fire-box side of the furnace is enclosed in a crude housing of poles and straw, which serves as a protection from the cold and breaks the effect of undue draft on the fire.

Rivero states that in smelting metals a certain loss cannot be avoided, but with mercury, until the exact conditions are understood, it is not only possible to



Llamas at Pulacayo.

lose much, but all of it, although working conscientiously. If the mercury vapors are not thoroughly cooled within the aludels they evaporate into the atmosphere, and it is possible that millions of quintales, so he says, may have been lost without a trace being found in the region. It was impossible to calculate the losses, as the grade of ore, coarse and fine, and discarded, was not determined. During the operations of the 'Gremios de Mineros', covering a period of over 200 years, abundant rich ore was available which was charged with the low-grade so as to produce mercury as quickly as possible, but in so doing heavy losses were incurred. Rivero is of the opinion that poorer ores were being smelted in 1843, with much more attention paid to preventing losses, which he states were at least 10%. Crosnier, in 1851, puts the loss at 50 per cent.

In Huancavelica 76 furnaces produced 40 to 50 quintales per week, while in Almadén, during the same time 500 to 600 quintales were produced from 16 furnaces, the capacity of these being 10 to 12.5 tons per charge. The ores of Almadén were of higher grade.

In 1792 there existed 18 furnaces belonging to the mines, and 93 to private parties. The former produced 700 lb. per week from 65 to 70 charges, each charge producing from 10 to 12 lb. of mercury. The mine Trinidad Chica yielded from 20 to 25 lb. per charge. The cost to smelt averaged 33 pesos per quintal. With mining charges and other expenses the total amounted to 93 pesos per quintal of mercury. Working all year, without repairs or shut-downs, a furnace could produce 20 to 30 quintales of mercury, assuming the average ore to be smelted, that is, a yield of 14.5 lb. per charge. During the

period from 1745 to 1756 the Spanish Crown paid 74½ pesos for a quintal of mercury; from this one-fifth was deducted for the 'royal account', 2% toward the support of the hospital, and 0.05% for leakage in handling the mercury. The total deductions, 22½%, brought the net price paid to miners to 57.5 pesos. The price was arranged so that the mines in Almadén, Spain, could compete and ship their mercury to South America, thus fostering the home industry. Of the 57.5 pesos received, 27.5 pesos were used in buying supplies, and 30 pesos to cover labor and living accounts. Complaining against this low return of 30 pesos per quintal, when working low-grade ores and suffering from expenditures on the furnaces, the price was raised to 35 pesos per quintal, the Crown keeping the furnaces repaired.

From the description given it is evident that the wasteful practice in smelting the ore must have resulted in higher losses than those indicated by Rivero and Crosnier. Considering the various sources of loss, there are: (1) Crude construction of furnaces, allowing crevices for escape of mercurial vapors. Also poor arrangements for condensing the vapors, and the crude system of luting the connections between the tubes and the aludels. (2) Poor quality of fuel used, not yielding enough heat for the complete distillation of the mercury in the ore. (3) Carelessness of the furnace-men in smelting, as regards watching the fire, openings in the furnace, testing smelting period, and the like. (4) Apparent disregard of the soot produced, which was only treated to a small extent. Permeation of mercury in the ground, as well as in the furnace-walls, was another cause of loss. (5) Intermittent process of



A (upper), Bolas; A A (lower), Aludels; C Outlet Tubes.

View of Upper Part of Furnace.

smelting. (6) Action of the acid waters on mercury.

It is evident that the mercury production resulted only from that caught in the aludels, which served as crude condensers, so little attention being paid to keeping them cold. In Idria, Austria, where wood was used as fuel, and better furnaces and condensing arrangements employed, 20% of the mercury produced was caught as metal in the condensers, but the mercurial 'soot' ('stupp') in the furnace is collected and treated separately, hence it would not be reasonable to expect a better extraction in the Huancavelica furnaces, and it would be fair to allow 80% for losses by evaporation, in soot, and in undecomposed ore. Although this seems a high figure, there appears to be sufficient proof as to its probability. Modern

furnaces should obtain from the ore the high extractions now made in other parts of the world.

Detailed furnace costs for smelting from January 1 to June 3, 1792, corresponding to a production of 98,900 lb. of mercury are given below :

| | Pesos. | Reales. |
|---|--------|---------|
| 'Oyaricos', 6392 charges, at 4 reales..... | 3,196 | .. |
| Furnace help, 25,568 charges, at 3 reales..... | 9,588 | .. |
| Masons and brick-layers on furnaces, 183 shifts, at 6 reales..... | 137 | 2.0 |
| Sorting fine ore, etc., 2503½ shifts, at 3 reales | 938 | 6.5 |
| Mason work on furnaces, 5 shifts, at 5 reales. | 3 | 1.0 |
| 13 reams of paper, at 6 pesos each, for binding 14 books | 108 | .. |
| Repairs to furnace, 42 shifts, at 4 reales..... | 21 | .. |
| Bowls, cloths, and 3 cowhides..... | 12 | 6.0 |
| Total | 14,004 | 7.5 |

STAFF PAYROLL.

| | Pesos. | Reales. | | |
|---|--------|---------|--------|-----|
| 1 director, 26 weeks, at 15 pesos | 390 | .. | | |
| 1 inspector, 26 weeks, at 12 pesos | 312 | .. | | |
| 3 overseers, 26 weeks, at 99 pesos | 702 | .. | | |
| 13 mayordomos, 26 weeks, 11 at 6, 2 at 8 pesos..... | 2,132 | .. | | |
| 1 head foreman, from April 22 to June 3, at 4 reales per shift | 21 | 4.0 | | |
| | 3,557 | 4.0 | 3,557 | 4.0 |
| Furnace supplies and straw, 10,659 'piaras' of straw at 10 reales | 13,324 | 0.5 | | |
| Various furnace parts..... | 158 | 6.5 | | |
| 36 cowhides and 120 earthenware vessels, at 1 real..... | 19 | 4.0 | | |
| 3583 tubes, and 195 covers, at 1 real | 472 | 2.0 | | |
| 33 loads of bowls and poker.. | 21 | 5.5 | | |
| | 13,996 | 2.5 | 13,996 | 2.5 |
| Total | 13,558 | 6.0 | | |

Cost per quintal of mercury produced, 31.91 pesos.

At present the only work going on is that of producing a quintal or two of mercury per month. One man does the drilling and blasting, while two peones pack the ore to the furnace, where they help to charge the ore and bolas, in addition to the regular charger and foreman. The costs of smelting, per charge of 1.5 tons, of coarse and fine ore per 24 hours is as follows:

| | Soles, per 24 hr. |
|--------------------------|-------------------|
| 1 charger | 0.60 |
| 1 foreman | 1.00 |
| 300 lb. llama-dung | 0.60 |
| 100 lb. straw | 0.20 |
| 500 bolas | 0.25 |
| Furnace repairs | 0.45 |
| | 3.10 |

This is equal to 2.07 soles per ton of ore. The production of mercury is about 9 lb. of mercury per charge. Miners are paid 80 centavos per 9 hours, and ordinary labor 50 centavos. The mining costs about 1.50 sol per ton. To erect a furnace costs from 250 to 300 soles (£25 to £30). It is repaired yearly. Outlet-tubes cost 30 centavos each, and last three or four years. Aludels (bowls) cost 10 centavos each.

and must be replaced every four to six months. Freights to Huancayo, the nearest shipping point, cost about 45 soles per ton, or 2.25 soles per quintal. From Huancayo to Callao by railroad costs 35 soles per ton.

The location of the continuation of the railroad from Iseuchaca southeasterly to Ayacucho, has not been definitely decided, but it is probable that a spur will be built into Huancavelica. Meanwhile the line from Huancayo to Iseuchaca, one-third of which is graded, should be open for traffic within three years, and thus put Huancavelica within 50 kilometres of a railroad, which route would be over a good trail, except for the ascent from Iseuchaca and the descent into Huancavelica.

GEOLOGY OF THE COALINGA OIL DISTRICT.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM FORSTNER.

It has lately been contended that underlying the Miocene oil measures of the Coalinga oil district, Eocene oil-bearing measures can be traced continuously from the Oil City pool, north of Coalinga, to beyond the Devil's Den. On thus subject I submit the following notes:

The wells of the Home Oil Co., in Oil City, in W. ½ N. W. ¼ section 20, T. 19 S., R. 15 E., are situated in the Eocene (Tejon) formation. The oil in these wells, underlying the Eocene shales, are of Eocene age, and are not the same sands as those from which the wells in the east side field derive their oil, the latter being of lower Miocene (Vaqueros) age. The Kreyenhagen wells, in S. E. ¼ section 32 T. 22 S., R. 16 E., are situated at the contact of the Eocene shales and the underlying Eocene sandstones, and the producing oil sands are of Eocene age. The upper well of the Avenal Land & Oil Co., in Big Tar canyon, in E. ½ E. ½ section 18, T. 23 S., R. 17 E., starts in the formation underlying the Eocene shales, and derives its oil from Eocene sands. The eastern or lower well of same company in same canyon, starts in the Vaqueros; at a depth of 1000 ft. it yielded some light oil, 28°B., whether from the strata underlying the Eocene shale, or from sand strata interbedded with the Eocene shale, is an open question. The Baby King well in N. E. ¼ section 11, T. 23 S., R. 16 E., starts in the Vaqueros close to its contact with the underlying Eocene shale. In Bulletin No. 357, United States Geological Survey, p. 109, it is stated that at 400 ft. 30°B. oil was struck, and at 1100 ft. 18°B. oil. At present some heavy oil is found in the water flowing out of the well. As the log of this well is not at hand, it is impossible to state whether this well cuts through the Eocene shale and reaches the underlying sands or not. The well of the Devil's Den Consolidated Co., in section 22, T. 25 S., R. 18 E., starts in shale. It lies on the west slope of an anticline, which runs in a southeasterly direction through the shale belt south of Dagany Gap. The structural and textural characteristics of the Eocene and middle Miocene brown shales are so similar, that without thorough paleontologic study it is impossible to differentiate them, unless by their relation to the lower Miocene (Vaqueros), which separates them stratigraphically. The massive shale running southeast from Dagany Gap

ROUND MOUNTAIN MINES AND HISTORY.

By J. P. LOFTUS.

*Round Mountain lies to the north of Goldfield 100 miles. It is an isolated hill on the east edge of Smoky valley, segregated geologically and geographically from the main range. The hill which rises 1500 ft. above the plain, is an early andesite, fissured around three-fourths of its entire base in concentric circles half way to its summit. This fissuring, due to later disturbance, follows unusually uniform lines, and represents points of original weaknesses in the mountain structure. As far as an agreement has been reached, the ore mass is an altered form of the original rock, enriched and silicified by a thermal flow from some deep seated point in the mountain. The veins dip into the hill at an angle of about 25° from the horizontal, and followed to the lowest depth yet reached, 800 ft., show no change in structure or ore character. The gold is free, unassociated with any base; the ore mass—which runs from 8 to 14 ft. thick—being highly oxidized. Sulphides appear nowhere, nor has a drop of water yet appeared in the deepest works.

Gold was first discovered at this point in February, 1906, on ground owned by Louis D. Gordon. So sensational was the find that Goldfield men trekked hurriedly across the unknown wastes and mountains, and a new camp was born. This was the beginning, and for a few months, Round Mountain showed greater promise of golden wealth than even Goldfield at its best. Slabs of virgin metal were almost daily found. Organizations by the dozen sprang into existence over night; for a time money poured in for development. The mine is now developed to a depth of 800 ft., equipped with a 100-ton mill, and has produced to date, in a period of two years, \$709,184 in gold bullion, and has paid \$192,184 in dividends.

On a bleak morning in February, 1906, sitting among the rocks, viewing a trench scarce a foot deep and ten in length, Louis Gordon agreed with J. R. Davis, for a consideration of \$87,000 to sell the control—and the hole not two feet deep! Inside of 11 months that ground was pouring out gold; in 18 months the first quarterly dividend was declared. Ore is now blocked out in the mine and cash in its treasury to a value approximating \$900,000.

The mill treats 100 tons of ore per day, yielding 93% of the ore value. It has never stopped a day nor an hour through any defect in construction. It was built at a total cost of \$40,000, and occupies an unusually small space.

The manager's report for the fiscal year closing July last, showed the average value of the ore treated to be \$13.40; the extraction, simple plate amalgamation, with no cyaniding or concentrating of any kind, to be 93%, leaving in tailing \$1.10. The cost of mining for that period was \$6 per ton, which, has by the introduction of electric power and machine-drills been lowered to \$4.17 per ton—demonstrating that \$5 ore can be mined at a profit.

Of the future of the mine no one can speak of a certainty. Adjoining ground has been acquired until now the total area of the Round Mountain Mining Co. covers 700 acres, nearly one-half of the entire mountain.

The total production of the camp may be estimated as below:

| | |
|-------------------------------|-------------|
| Round Mountain Mining Co..... | \$709,000 |
| Placers | 150,000 |
| Sphinx | 60,000 |
| Daisy | 60,000 |
| Lessees (various) | 30,000 |
| Fairview | 60,000 |
| Total | \$1,069,000 |

ROUND MOUNTAIN, NEVADA.

By F. L. RANSOME.

*A few hours were spent at Round Mountain, Nevada, on June 29, 1908, and the following notes are based upon the necessarily hasty examination possible in so short a visit. The town of Round Mountain, which contains from 500 to 600 people, is in Nye county, 45 miles (about 70 miles by road), north of Tonopah and nearly the same distance south of Austin. It lies on the east side of Big Smoky valley, at the base of the Toquima range, being 12 miles north of Manhattan and three miles southwest of the abandoned mining camp of Jefferson. Further details regarding the surroundings of the district may be had from the Tonopah topographic sheet of the United States Geological Survey, and a good general description of the camp has been published by George A. Packard.† The town takes its name from a small oval hill of rhyolite which rises about 400 ft. above the alluvial slope of the valley's edge. There is abundant water for all ordinary purposes, a supply from Shoshone creek, east of town, having been made available by an outlay of \$65,000.

The rhyolite of Round Mountain is generally fresh, with abundant phenocrysts of quartz and feldspar, up to about 5 millimeters in diameter, in a light-gray lithoidal matrix, which, as a rule, shows some flow structure. No microscopical study has been made of this rock, but it appears to be a normal rhyolite with orthoclase (sanidine), as the principal feldspar. According to Mr. Packard, granite has been found underlying the rhyolite near the saddle connecting Round Mountain with the main range east of it, and some shafts east and northeast of the hill are said to show slate and quartzite. The only mine examined during my visit was the Sunnyside, on the south slope of Round Mountain. This, the principal mine of the district, is worked through a 35° shaft to a depth of 550 ft., measured on the incline. The levels are 50 ft. apart and explore the vein for a length of about 300 ft. The general strike of the vein is nearly east and west. The orebody is fully 300 ft. long and from 6 to 20 ft. in width as measured in horizontal planes and extends from the surface to an unknown distance below the bottom level. The dip varies

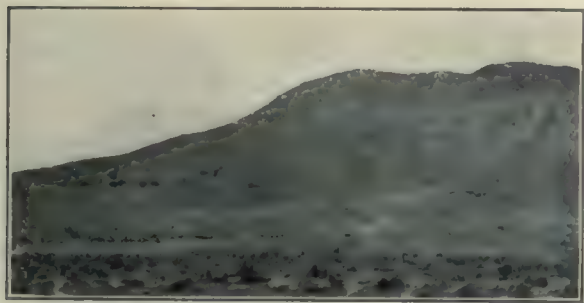
*Abstract from Contributions to Economic Geology, 1908. Bulletin 380, U. S. Geological Survey.

†Round Mountain, Nevada: MINING AND SCIENTIFIC PRESS. June 13, 1908, pp. 807-809.

*Abstract from address before American Mining Congress at Goldfield, Nevada.

from 35°N. at the surface to 20°N. on the 550-ft. level.

The ore is all oxidized and carries, on an average, from \$10 to \$15 in gold to the ton. Ore worth \$25 a ton is exceptionally good. Although the deposit has been referred to as a vein, it is not really of that class. It is a mass of jointed and irregularly cracked rhyolite, somewhat stained with iron oxide, but showing no conspicuous alteration and no evidence of extensive movement. In most places the ore is separated from the country rock of the hanging wall by a close fissure or joint, the difference between ore and waste being not, as a rule, evident to the eye. Such a joint, when followed along the strike, is found to pass at some point into the ore or into the country rock, and another one of slightly different strike takes its place as a working boundary to the ore. The hanging wall is thus defined by a series of joints that intersect or meet at large angles. The distinction between ore and country rock is less definite on the foot-wall side of the deposit. On the



Round Mountain, Nevada.

whole, the limits of the orebody must be determined by panning or assaying and are not certainly recognizable from structure or appearance.

The value of the ore is practically all in gold, which is readily amalgamated. The mill, equipped with 2 Nissen stamps, 2 Huntington mills, and a tube-mill, treats about 100 tons per day and extracts 92% of the gold. Some coarse gold is found, associated with limonite in crevices in the rhyolite, but in most of the ore none of the metal is visible. No pyrite was seen in any of the ore, although a little was noted disseminated in the rhyolite at one place on one of the lower levels. In 1908 the mine, according to J. P. Loftus, president of the company, was producing from \$35,000 to \$42,000 a month. Steam power is used. The fuel is wood from the Toquima National Forest, purchased at \$1.25 a cord, and cut and delivered at a total cost of \$8 to \$10 a cord.

A few hundred yards west of the Sunnyside mine some lessees have a shaft 200 ft. deep on what is probably a continuation of the same deposit. At the time of visit they were hoisting \$15 ore, which was hauled to a mill near town and there treated at a total cost of \$7 per ton. West of this lease, near the west end of the hill, is the Sphinx mine, 200 ft. deep, and probably also on the same zone of mineralization. The ore at the time of visit was similar to that of the Sunnyside mine but of lower grade, the average value being a little less than \$10 per ton. About 25 tons per day are treated in a Huntington milling plant

with no stamps. The Fairview and Daisy mines, east of Round Mountain, were producing in 1908, but were not visited. Their ore is said to lie in rhyolite and to be similar in general character to that of the Sunnyside. The Fairview has a 20-ton mill on Shoshone creek, a mile northeast of town.

A notable feature of the south slope of Round Mountain is the wide distribution of the gold. Along the whole south base of the hill the superficial detritus or wash carries gold. This material, which consists of angular fragments of rhyolite of all sizes up to a few feet in diameter, with more or less earth and sand, has a maximum thickness of about 10 ft. It shows only traces of rough stratification and has accumulated by general creep down the slope accelerated by occasional heavy rains. At the base of the hill the deposit thickens and merges with the general wash of Great Smoky valley. Hydraulic operations are confined to the hill, where the bed-rock is within reach and where there is sufficient fall for sluicing. The gold is distributed through the deposit from top to bottom. When the rhyolitic bed-rock is exposed it is found to be covered in many places with a firm crust of buff-colored carbonate up to an inch in thickness. This adheres strongly to the fresh surface of the rhyolite as a rough, travertine-like crust and in places carries enough gold to make its removal by blasting profitable, especially as considerable gold is carried also in the superficial cracks of the rhyolite. Two monitors were playing in June, 1908, and the washing, according to Mr. Loftus, was yielding about \$20,000 a month. The water, however, was getting rather low and it was not possible to keep both streams in continuous operation. Prior to the use of water, gold to the value of \$39,128 was obtained with two dry-washing machines. The ground worked by this method is said to have averaged over \$5 per yard.† The gold is generally rather fine, but some nuggets of fair size have been found. A large part of the rhyolite on the south side of Round Mountain, both under the wash and higher up the slope, contains considerable gold, partly in visible joints or small fissures, and partly in rock which is not noticeably fractured. Where the joints are close together and the rhyolite between them rather soft and decomposed, assays as high as \$250 per ton are said to have been obtained from samples taken near the surface; and from solid blocks of unfissured rhyolite assays up to \$4 per ton are reported. How far this gold represents mere superficial enrichment is still an unsolved problem. In 1908 prospecting was in progress to determine whether or not extensive masses of rhyolite on the south side of the hill can be worked by an open-cut method for the gold scattered through the rock.

Aluminum is used in constantly increasing quantities in the motor-car industry, combining both lightness and stiffness. It is used in making crank-cases, gear-boxes, carburettors, radiators, dash-boards, and in smaller ways. In castings it has been found advantageous to alloy the metal with copper, zinc, or nickel, which increases its strength and makes it easier to work.

†Packard, G. A., *op. cit.*, p. 809.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Mining locations may legally overlap previously acquired territory held by others, whether patented or unpatented or whether held under agricultural or mineral laws or whether the inclusion is due to accident or design or with the consent of the owner, or without, if peaceably done.

Charcoal from nut-pine (piñón) which grows abundantly over the mountains of the semi-arid Southwest, is of excellent quality if well burned. For lead-smelting it would make a satisfactory fuel, but it would be advisable to burn it for that purpose in kilns rather than in open heaps.

Four-stamp batteries are so rare that no recognized practice can be stated concerning the order of drop, but as the order is intended to maintain as uniform a distribution of rock and pulp in the mortar as possible it is manifest that such a result should be obtained by dropping in the order 3-1-4-2.

The mere doing of assessment work upon a claim held without 'discovery' will not prevent adverse relocation. Marking the boundaries, coupled with actual possession and the continuous exploitation or prospecting of the ground, in good faith, will generally hold a claim against all the world without discovery.

Limit of accuracy in gold assaying is probably reached by the work done at the Philadelphia and the Utrecht mints a couple of years ago on proof-gold. Samples were exchanged for comparison by the two mints, and the Utrecht 'proof' was found to be slightly purer, the difference between the two being 0.00002 in fineness.

Iron in lead smelting performs three functions. It supplies a base for the silica present; it is reduced from the oxide in the flux by carbon, or carbon monoxide, and the metallic iron so produced directly replaces the lead in PbS, the result of the re-action being metallic lead, ferrous sulphide (FeS) and CO₂. Finally it substitutes itself in the place of lead oxide in the lead silicate formed in the blast-furnace, after which the PbO is reduced by carbon.

Bullion sample-bars are not as accurate as discs. The molten metal may be poured into a shallow circular iron mold. With a power-cutter, or even with a chisel, a sector may be taken from this disc, like a piece of pie. The tendency to segregation of gold and silver on cooling is well known. This method of sampling overcomes the irregularity which would result therefrom, and which interferes with accuracy in testing a rectangular bar. This method is also more accurate than granulating by pouring in water.

Sand for concrete should contain not over 0.1% organic matter. If it exceed that figure the tensile strength of the concrete will be lessened. The safest rule is probably that of the American Society of

Civil Engineers' Committee on Concrete and Reinforced Concrete, as follows: "Mortars composed of 1 part portland cement and 3 parts fine aggregate by weight, when made into briquettes should show a tensile strength of at least 70% of the strength of 1 to 3 mortar of the same consistence made with the same cement and standard Ottawa sand."

Pitch of a thread is the distance from centre to centre of two adjacent threads. It is the reciprocal of the number of threads per inch. For example, if the number of threads be 16 per inch, then the

$$\text{pitch} = \frac{1}{16} = 0.0625 \text{ inch.}$$

The 'lead' of a screw-thread is the distance the screw will travel forward when given one complete revolution. For a single-threaded screw the pitch and lead are equal, but if a screw be provided with a double thread then the lead is equal to two times the pitch.

Puddle is a mixture of gravel and clay, wetted, and rammed into place. The gravel is used to insure the crumbling of the sides and roof of any incipient hole which may occur in the puddle-wall, causing it to fill up. A good proportion for the ingredients of an impermeable puddle-wall, according to John T. Fanning, is: Coarse gravel, 1 cu. yd.; fine gravel, 0.35; sand, 0.15; and clay, 0.20. This, when mixed will make 1.3 cu. yd., and upon ramming reduces to 1.25 cu. yd. Another mixture, which will make 1.1 cu. yd., on ramming, is gravel 1 cu. yd., sand 0.35, and clay 0.25. Puddle may be used as the core of an earthen dam; also as an impervious lining for reservoirs.

Cones used for testing temperatures in clay burning vary as to fusing point with composition. The fusing points of the cones most used are given below:

| Cone Number. | Fusing point. | |
|--------------|---------------|---------|
| | Deg. C. | Deg. F. |
| 0.022..... | 590 | 1094 |
| 0.015..... | 800 | 1472 |
| 0.010..... | 950 | 1742 |
| 0.050..... | 1050 | 1922 |
| 1.000..... | 1150 | 2102 |
| 5.000..... | 1230 | 2246 |
| 10.000..... | 1330 | 2426 |
| 15.000..... | 1430 | 2606 |
| 20.000..... | 1530 | 2786 |
| 25.000..... | 1630 | 2966 |
| 30.000..... | 1730 | 3146 |
| 36.000..... | 1850 | 3362 |

Natural asphalt imported from Trinidad and Bermudez supplies a large part of the paving material used in the United States. Oil asphalt, when properly made in the process of distillation of asphaltic oils, is free from earthy substances commonly carried by natural asphalt, and, though hampered by freight charges, is brought to the Eastern markets in large quantities. Bituminous rock is used chiefly for paving. The other important uses of asphalt products are in waterproofing metals, papers, and fabrics, in roofing, electric installations, wood preservation, brick and wood block filling, concrete construction, coal briquetting, adulterating hard rubber, and the like. Gilsonite and grahamite are also especially adaptable for use in the manufacture of japans, paints, and varnishes.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINING LEASE—SIGNIFICANCE OF 'CREVICE' OR 'RANGE'.

The word 'range' as applied to mineral deposits is commonly understood to designate a large stretch of country, often many miles in length and of considerable width, carrying with some continuity, or at intervals, ore deposits belonging generally to the same geological stratum. A 'crevice' is a word sometimes applied to a mineral-bearing vein; but under the Wisconsin statute the words 'crevice' or 'range' had a local significance, limiting the word 'range' by its associated word 'crevice', and taken together they were not intended to designate a large stretch of country carrying with some continuity, or at intervals, ore deposits and belonging generally to the same geological stratum.

St. Anthony Min. & Milling Co. v. Shaffra (Wis.) 129 N. W. 238, March, '09.

LOCATION NOTICE.

Under a statute providing that the locator of a mining claim should post his notice of location at the point of discovery, a locator posted his notice at a different place, but thereafter posted it at the point of discovery, and in an action by a conflicting claimant, and as against his intervening rights, the location of the original locator was postponed to the date when he posted the notice at the point of discovery, as the statute required. And where the location notice described the vein as north and south, it was held sufficient to support a location of a claim along a vein east and west.

Butte Northern Copper Co. v. Radmilovich (Mont.) 101 Pac. 1078, May, '09.

LEASE OF MINE—DISCOVERY—REVOCATION.

A miner operating under a license from a lessor, terminable at his will, in case of the discovery of a prospect, may continue his exploration free from the lessor's right to revoke the lease before the prospect has been sufficiently explored to determine whether it will lead to a discovery or not, and in case of a discovered vein or crevice, to entitle the miner to follow the deposit within the lines of the leased premises lengthwise, sidewise, and downward, on paying the current royalty to the lessor.

St. Anthony Min. & Milling Co. v. Shaffra (Wis.) 129 N. W. 238, March, '09.

MINING—DISCOVERY.

The development and uncovering of a mineral deposit in a known mineral-bearing lode and along side of old workings which existed long prior to the inception of the lease, did not constitute 'discovery' within the meaning of a statute which provided that the discovery of a crevice or range containing ores should entitle the discoverer to follow it until it was exhausted free from the right of the landlord to forfeit the lease.

St. Anthony Min. & Milling Co. v. Shaffra (Wis.) 129 N. W. 238, March, '09.

APPLICATION OF STATUTES TO MINING.

The statute of Wisconsin regulating mining was held by the Supreme Court of that State to apply only to mining contracts and leases either oral or written for the digging of ore and minerals, when there was no contract between the parties contrary to the statutes and where there were no terms established by the landlord contrary to its provisions.

St. Anthony Min. & Milling Co. v. Shaffra (Wis.) 129 N. W. 238, March, '09.

SINKING DISCOVERY SHAFT.

A locator is not required under the statute of Montana to sink his discovery shaft at the point of discovery.

Butte Northern Copper Co. v. Radmilovich (Mont.) 101 Pac. 1078, May, '09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

DEVELOPMENT OF A NEW WESTERN TERRITORY. By W. W. Weston. Bankers Magazine, August, 1909.

Construction of railways as a means of opening territory has been a characteristic method of development in Western States. Mr. Weston tells, in this article, how it is being done in the case of the Denver, Northwestern & Pacific railroad which D. H. Moffat is now building into northwestern Colorado. The region has much of interest to mining men and in the opinion of Mr. Weston is not only destined to be a great farming and fruit raising country, but a mining country as well. It contains the hydro-carbon field of Uinta county, Utah, with veins of gilsonite, the available tonnage of which has been estimated by the engineers of the United States Geological Survey at 32,000,000; and as this product is worth \$30 per ton, a vast potential wealth is represented. There are also many veins of elaterite and ozocerite, which products are still more valuable, and reefs, miles in extent, of sandstone asphaltum, which will be rendered available to commerce by the advent of the road. Among other undeveloped hydro-carbon products in this valley are also oil and vast areas of bituminous shales.

NOTES ON PRACTICAL MECHANICAL DRAWING. Written for the use of students in engineering courses by Victor T. Wilson and Carlos L. McMaster. 3d ed., revised and enlarged. Published by the authors at East Lansing, Michigan, 1909. Price, \$1.50.

This useful little volume has a field of its own. Insistence is not made on geometrical drawing, but the principles are largely illustrated by the use of actual problems, such as arise in practice, from the very beginning. It deals with orthographic projection, isometric and oblique drawings, use of instruments, working drawings, machine sketching, and contains a good description of blue-print processes and reproduction.

CHROME IRON ORE DEPOSITS. By Fritz Cirkel. Canada, Department of Mines, Mines Branch, No. 29. Pp. 141. Ottawa, 1909.

An illustrated account of the occurrence of the ores in the Eastern townships of the Province of Quebec.

Catalogues Received.

BLAISDELL Co., Pacific Electric Bldg., Los Angeles, California. Catalogue L, 'The Blaisdell Patent Vacuum Filter Leaf'. 4 pages. Illustrated. 6 by 9½ inches.

JOSEPH DIXON CRUCIBLE Co., Jersey City, New Jersey. 'Dixon's Foundry Facings'. Information on the proper use of facings; a list of the different kinds carried, including prices. 12 pages. 3¼ by 6¼ inches.

THE PARAFFINE PAINT Co., 34 First St., San Francisco. Booklet of views showing buildings of the Alaska-Yukon-Pacific Exposition, illustrating the general use of Malthoid Roofing. 32 pages. 3½ by 5¼ inches.

DEARBORN DRUG & CHEMICAL WORKS. Postal Telegraph Bldg., Chicago, 'Water Treatment.' An elaborate pamphlet giving some historical facts about the firm issuing it, and the work which it is doing. Illustrated. 10½ by 8 inches.

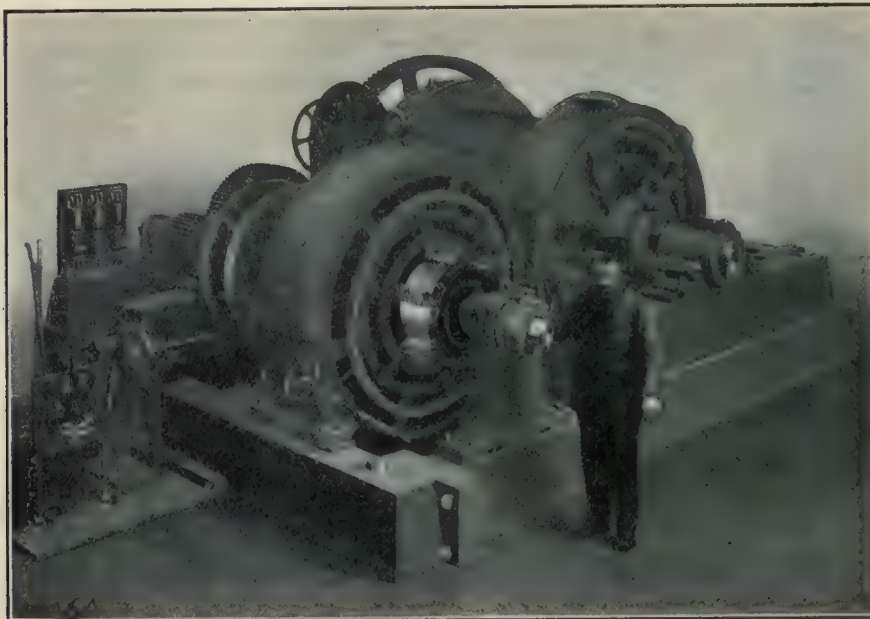
BAUSCH & LOMB OPTICAL Co., Rochester, New York. 'Unique Features of Bausch & Lomb Engineering Instruments'. A folding leaflet giving some information as to the engineer's instruments manufactured by this well known firm. 8 pages. 3 by 6 inches.

FAIRBANKS, MORSE & Co., Chicago, have issued a new catalogue (No. 80 D) describing their small engines from 1 to 12 hp., in which they describe for the first time the new 1-hp. engine 'Jack Junior'. This is a practical, durable 4-cycle engine, water-cooled, and is made to meet the demand for a small reliable engine for running light machinery. The catalogue describes the principles of operation and construction of their gasoline engines and is full of engineering suggestions stated in plain language for the benefit of engine users.

Five Hundred Horse-Power Electric Mining Hoist.

There was recently installed in the mine of the Washington Coal & Coke Co. at Dawson, Pa., by the Westinghouse Electric & Mfg. Co., a large mine-hoist with a motor presenting several features of interest. The hoist is used to haul 35 mine-cars, averaging 3800 lb. each when loaded, up a maximum grade of $8\frac{1}{2}\%$, 8000 ft. long, at a speed of 600 ft. per minute. The loaded cars start at the bottom of the slope on a 4% grade, which gradually increases until the maximum grade of $8\frac{1}{2}\%$ is reached near the top, where the loaded cars are pulled in on a landing on a grade of about 6%, and on a curve of 150 ft. radius. The empty cars will be allowed to run down the slope by gravity, controlled by a brake on the hoist-drum.

The drum itself is 6 ft. diam. and 5 ft. wide between flanges. It is fitted with a hand-brake on one end, and a hand-operated friction clutch on the other end. The drum is of heavy steel construction, with a 12-in. shaft. All the gears on the machine are cast-steel with machine-cut teeth, the main spur-gear being 10-in. face and the motor-gears 13-in. face. The frame is made in sections for convenience



in installing in the mine. The drum, large gears, and the friction clutch parts are also made in two pieces for the same purpose.

The hoist is driven through a flexible coupling by a 500-hp., direct-current, non-reversing, compound-wound Westinghouse motor. It is controlled by a standard semi-automatic Westinghouse magnetically-controlled unit-switch controller. These switches are operated from the controller shown in the illustration, the controller carrying only small currents, while the main motor-current is handled by the magnetically-operated switches, thus doing away with the difficulties from arching.

This controller has an accelerating relay which prevents the starting switches from closing too rapidly, and thereby prevents too large starting-currents. Thus the second switch cannot close until the current allowed to flow by the closing of the circuit has fallen to a pre-determined value. As soon as this value is reached the second switch closes, thereby short-circuiting a resistance section, and the current rises, but the third switch cannot close until the current has again fallen to the pre-determined value. This not only prevents injury to the motor from careless handling during acceleration, but also insures the most rapid starting possible. The controller also has a safety-relay which opens the resistance switches in cases of excessive overload, and thereby protects the motor while running. If this relay operates while the motor is running, the motor does not stop, but is automatically brought up to its full speed again. This is a particularly valuable feature in an installation of this kind where the cars may strike some obstruction, as it affords

perfect protection to the apparatus. When it is remembered that this hoist is installed some 800 ft. below the surface of the ground, the advantages of the electric transmission of power are evident. In no other way could this large amount of power be transmitted as economically nor as easily.

Commercial Paragraphs.

The Alaska-Yukon-Pacific Exposition has awarded grand prizes (highest award) for insulated wires and cables to the GENERAL ELECTRIC Co. and the JOHN A. ROEBLING SONS COMPANY.

THE KELLY FILTER PRESS Co., Salt Lake City, recently installed one of its presses in each of the following mills: Gold Issue M. & M. Co., Cripple Creek, Colorado; Alaska Treadwell Gold M. Co., Treadwell, Alaska; Enterprise M. Co., Cooney, New Mexico.

The SMOOTH-ON MFG. Co., Jersey City, New Jersey, has just published the eighth edition of its instruction book. It is fully illustrated and shows many of the different ways in which Smooth-On cements may be used. It will be sent free to any address.

WEED & PROBERT is the name under which Walter Harvey Weed and Frank Holman Probert have formed a partnership for practice as geological and mining engineers. Offices will be maintained at 42 Broadway, New York, and at the Central Bdg., Los Angeles, California.

The UNION IRON WORKS Co., San Francisco, has lately received an order from the South Eureka Mining Co., Sutter Creek, California, for a 20-stamp mill. It is worthy of note that the machine-shop and foundry of the Union Iron Works is running at full capacity.

ELI T. CONNER has opened an office as Consulting Mining Engineer at 1126 Real Estate Bdg., Philadelphia. He has had an experience of more than 25 years in the operation of anthracite

and bituminous properties, and makes a specialty of examinations for prospective purchasers, investors, banks, and trust companies, and with a view to suggesting betterments and improvements.

THE C. O. BARTLETT & SNOW Co., Cleveland, report the following recent orders: Kelley Island Lime & Transport Co., Cleveland, Ohio, one elevator, capacity 1000 tons of crushed stone per hour; and one elevator, capacity 600 tons of crushed stone per hour, said to be the largest elevators of the kind ever constructed; Winding Gulf Colliery Co., Cincinnati, Ohio, Greene self-dumping car-haul and complete outfit, capacity 2500 tons of coal per eight hours; William A. Clark, Butte, Montana, one ore dryer; American Smelters Securities Co., New York City, one ore dryer for mines at Santa Barbara, Chihuahua, Mexico.

Mineral Areas in Korea.

According to Thomas Sammons, Consul-General at Seoul, the Government authorities place the number of localities in Korea suitable for mining at 184, as follows: gold mines, 53; silver, 5; copper, 25; iron, 36; lead, 2; graphite, 34; zinc, 2; coal, 21; petroleum, 5; and mercury mines, 1. Aside from 7 gold mines, 2 copper properties, a number of iron prospects, two or three graphite mines, and a couple of coal deposits, the mineral resources of the kingdom are undeveloped and largely unproductive. A large number of claims have been filed, but the holders of mineral areas in Korea are, as a rule, unprepared financially to develop.

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TABLE OF CONTENTS.

| | |
|--|-------|
| EDITORIAL: | Page. |
| Notes | 573 |
| Sludge Abatement | 574 |
| Geological Survey Estimates | 575 |
| GENERAL MINING NEWS | 577 |
| SPECIAL CORRESPONDENCE..... | 582 |
| DISCUSSION: | |
| Deflecting Angles with a Thirty-Foot Tape..... | |
|Rufus J. Foster | 587 |
| Excess Ground in Mining Claims....Victor G. Hills | 587 |
| Factors in Successful Gold Mining..... | |
|Algernon Del Mar | 587 |
| ARTICLES: | |
| A World's Record in Tunnel Driving.Burt A. Heiny | 589 |
| Present Conditions at the Garfield Smelting Works. | |
|L. S. Austin | 590 |
| Copper in Southwestern Wisconsin.....G. H. Cox | 592 |
| Magnetic Separation | 592 |
| Modern Practice of Ore-Sampling.David W. Branton | 593 |
| Consolidation of Mother Lode Mines..W. H. Storms | 597 |
| Chart of Igneous Rocks.....Stuart Croasdale | 598 |
| Commencement Address.....John Hays Hammond | 600 |
| The Madill Oil Pool, Oklahoma..... | 601 |
| Japan's Mineral Output | 603 |
| CONCENTRATES | 602 |
| THE PROSPECTOR | 601 |
| DECISIONS RELATING TO MINING..... | 603 |
| DEPARTMENTS: | |
| Personal | 576 |
| Market Reports | 576 |
| Company Reports | 603 |
| Publications Received | 604 |

EDITORIAL.

AN aerial navy is being developed near Washington, doubtless to prevent competitors flying over our tariff wall.

PRODUCTION of copper at Cerro de Pasco, Peru, amounts to 4,000,000 pounds per month, and arrangements are being made to increase the output within a year to 60,000,000 pounds per annum.

ERRORS of fact by telegraphic correspondents led to our misrepresentation of President Zelaya. He was not as indiscreet as we were led to think; he was not at Cape Gracias á Dios; he is very decidedly at the nerve-centre of his caliphate, and will not be easily beaten.

SIXTY YEARS is a long period in the life of a trade journal, and we extend congratulations to the *Iron and Steel Trades Journal*, on its long career of usefulness. Its diamond jubilee issue is fittingly devoted mainly to retrospect, but room has been found none the less for a few cheerful words as to the future. "We shall continue to do our part to produce a good, reliable journal. We shall continue to express our honest convictions, even as regards the operations of multi-millionaire concerns, without fear or favor." Good. Such are the ideals of the best technical journals of today, and, we are glad to add, of the most successful ones. May our contemporary celebrate many more anniversaries!

STEALING ore is almost as safe and respectable as stealing railways. Occasionally, however, accidents will happen as at Manhattan, Nevada, recently when 'high-graders' in the Stray Dog mine found it necessary to shoot an unaccommodating Deputy Sheriff in order to get away with their booty. At Goldfield on the same day a man accused of having taken part in stealing concentrate valued at \$21,000, by means of a diverting device in the Consolidated mill, was discharged for lack of evidence. Ore thieves, so long as they confine their stealing to the mines, really have little to fear from American juries, owing partly to the elaborate legal doctrine argued at Cripple Creek that ore in place in the mine is real estate, and hence can not be stolen. This is small comfort, of course, to the manager who sees his receipts decrease in inverse ratio to the richness of the ore, but it gives solace to the accused.

COPPER production in the United States today amounts to 1,400,000,000 pounds per annum. The Cole-Ryan-Amalgamated group is responsible for 30 per cent of this amount, and the Guggenheims for 15 per cent. Following these are Phelps, Dodge & Company, Calumet & Hecla, American Metal, and L. Vogelstein & Company. The policy of the Guggen-

heims has been to produce and to accept ore from shippers without limitation, and until lately to sell copper rapidly, without regard to metal-sellers' agreements. As the Guggenheims have controlled supplies that could be produced more cheaply than the Cole-Ryan capitalists, they have been a disturbing element in the market. The latter restricted production for a period, as did Phelps, Dodge & Company. The output now is nearly normal. The attitude of Calumet & Hecla has been, as ever, loftily independent, but rational and conservative. Securely fortified by low costs unapproachable by rivals, it could undersell them and depress the market further, but instead of sacrificing ore reserves in that manner it has voluntarily curtailed its production about one seventh. Strong efforts are being made through J. P. Morgan & Company to effect a combination of copper interests to regulate output and prices. This manifestly cannot be done while so many important producers, such as Calumet & Hecla and the Guggenheims, are able to turn out copper at low prices. The Guggenheims will be strengthened by the output from the Braden copper mine in Chile, and the Cerro de Pasco will be a steadily growing factor with 5-cent copper. It will be as impossible under such conditions to effect a consolidation as it has proved for the United States Steel Corporation to absorb even 50 per cent of the steel-capacity of the country; but one powerful group, such as the Cole-Ryan, by its preponderating influence can and must serve as a regulator, with whom the others will co-operate within the limits of individual advantage.

Sludge Abatement.

Australia and New Zealand are becoming proving grounds for new methods of legislation and public administration. For the world at large they perform much the same useful function as does Oklahoma for her sister States. To say that they are socialistic requires special definition of that much abused word. But they do resort more readily than the rest of us to Government agencies to restrain individual and corporate activities. If other States and Nations are wise much useless experimental legislation may be avoided.

California has had its full quota of débris and anti-débris legislation. A great industry, that of hydraulic mining, has been practically killed by legislation to protect the agricultural lands of the Sacramento valley. Recently there has been agitation against dredging, and the question has been raised as to the extent, if any, to which dredging pollutes the streams. Not improbably in time, here as elsewhere, there will be agitation against turning into streams waste cyanide solutions and even ordinary mill-tailing. There can be no question that as population increases in density in America, the whole problem of stream pollution will come up repeatedly, and legislatures and courts will be called on to work out the necessary compromise between the ideal clear stream immediately available for drinking and the 'common sewer' plan of making streams dumping places of all the waste and filth of civilization.

In Australia some provision for study and abatement of these nuisances has been made in the creation

of Sludge Abatement Boards. The reports of the Victoria Board for 1907 and 1908 are recently at hand and offer material of particular interest. The method of work of this Board is not unlike that of the Interstate Commerce Commission; that is, complaints of nuisances as received, are investigated by special agents, followed if need be by public hearings, and finally, if the evidence justifies, by an order for its abatement. It is interesting to see that much the same complaints are made in Victoria as were ventilated this summer at Sacramento, and that there, as here, careful investigation shows them to be essentially groundless. For example in one case of alleged damage due to dredging, the Board finds: "When a bucket dredge was working a few years since in the bed of the Goulburn, some miles below Jamieson, settlers down stream were unaware of its presence. We have found that local complaints * * * are principally due to gravitation sluicing claims in the hills and to erosion of drains and creek banks." The importance of sedimentation due to erosion of ditches, roadways, and to other disturbance of natural conditions due to public works, is especially emphasized. In one case a complaining town was shown by the testimony of its own engineer to have furnished in this way to the stream more detritus than the whole possible from the mining of which complaint was made. The Board further says: "Beyond what might reasonably be expected from natural denudation and erosion in a large stream, subject to such varying volumes of discharge as the Goulburn, the evidence and observations disclose no abnormal siltation of the river flats," and further: "Some of the farming witnesses object to all discoloration, and apparently would not be satisfied in summer time with water almost clear, though compelled even where there is no mining to use worse water during winter and spring. The Board cannot recommend the extinction of a valuable industry on account of ill-grounded objections of persons not acquainted with the nature of the work, many of whom would not, owing to distance from the mines, be subject even to discoloration of water by their operations." Such a principle is sound, and its enunciation gives confidence that in the cases where the Board has ordered that tailing be impounded, real reason for the order exists.

Not less interesting are the findings of the Board in several cases involving the turning into the streams of waste cyanide solutions. It is not unnatural that some apprehension should exist among people living below a cyanide plant and dependent upon the stream for water for themselves or their stock. Two samples were taken from water courses immediately below cyanide works at Bendigo and the analyst found: "No cyanide of potassium present in the liquid. There is no chemical ingredient injurious to vegetation in any of the above samples." This accords with our own experience in catching fine mountain trout within a few yards of the discharge of a cyanide mill. The whole work of the Board seems to indicate that when these problems are intelligently and honestly studied the amount of damage is neither so large nor the means of abatement so difficult as to cause serious uneasiness.

Geological Survey Estimates.

The estimates of the Director of the Geological Survey for the fiscal year beginning July 1, 1910, have been made and approved by the Secretary of the Interior. In notable contrast with other Bureau estimates for the year they provide for increases in appropriation for geology, study of Alaskan mineral resources, study of water resources, and study of structural materials. That the Director should make, and the Secretary approve, estimates involving increases, in the face of direct intimations from the President to the effect that all estimates were to be decreased, is strong presumptive evidence of the need of the money. It is also flattering recognition of the importance of the mineral industry. We propose to examine these estimates individually, taking first the sum requested for additional geological studies.

The United States Geological Survey began its work in 1879 with a total appropriation of \$100,000 to cover all its activities. It is only a few years since the amount available was scarcely a half million dollars. For the current year the money devoted to this branch of the public service amounted to one and three-quarters million dollars or, deducting money spent for rent and expense of printing, which is not administered by the Director, the total was \$1,497,390. Of this sum \$225,000 was for the geology, to which also a portion of the money for statutory and temporary salaries was applied. In all probability \$250,000 or more was available for geologic work within the United States.

It is evident from this increase in appropriations that the work and conduct of the Survey has commended itself both to the public and to Congress. The Survey is everywhere recognized as one of the cleanest and most efficient bureaus in the public service. Its career has been long and honorable and its usefulness is universally recognized. The intimate relations between geology and ore deposits have always led mining men to look upon the Survey as belonging peculiarly to them, and in certain circles there has been some not unnatural jealousy over the large amount of money and attention recently devoted to subjects not immediately related to mining. We are apt at times to forget that geology is one of the sciences that has numerous relations—to agriculture, to forestry, and to general engineering—and that a public service bureau has responsibilities in all directions in which it can be useful. Nevertheless it may be fairly urged that work in the Western metalliferous districts, if not actually curtailed, has decreased in amount and importance in comparison with the newer activities of the Survey. A few years ago Emmons, Becker, Spurr, Lindgren, Ransome, Weed, Boutwell, Irving, and a brilliant group of younger men, were simultaneously working on Western ore deposits. Of these, except Ransome, no one continues to devote his major attention to such work for the Survey. The lure of private work, the burden of administration, or the attraction of other problems, has drawn each away, and the group of younger men who were coming up to take their places is mainly scattered and gone. It cannot be urged that the problems of ore deposition are less in-

teresting or less important than in earlier years. It is true that detailed geological and structural maps of many districts are now available, that the problems of ore genesis are somewhat better understood, and that the discovery of the laws of secondary enrichment has made prospecting of the porphyry copper ores, especially, much more certain. The rapid exploration, however, of the areas capable of being prospected by mere sampling of outcrops, has made more study and the scientific direction of prospecting necessary. The smelting industry of Colorado is today in unstable equilibrium because of lack of suitable silicious ores; and Colorado has been prospected and re-prospected by the old methods. Yet it would be a hardy prophet who would affirm the absence of the very ores needed. There remain also many camps which are still unsurveyed and others demand re-survey and re-study. The Geological Survey should be increasing its activities in the metal-mining districts instead of decreasing them. It needs more men, more money, and new methods. It must do its part, which doubtless will be large, in developing scientific prospecting, just as the Department of Agriculture has developed scientific farming. The United States Government is still, probably, the largest owner of mineral lands, and it is probable that it will ultimately become necessary to prospect them before sale, adding the cost of prospecting to the sale price, much as the Reclamation Service puts water on desert land and then sells the latter at an increased price. The difficulties in the way of such work are numerous and its need is not immediate, but these are all the stronger reasons for looking to the future and being ready for the task when it comes.

The reason why the Survey-work in the Western metalliferous regions has not been vigorously pushed recently, lies in its increased burden in connection with the classification of public lands, especially those containing coal. The importance of these classification surveys cannot be denied, but they should not be pushed at the expense of equally necessary studies of other lands. Mr. James A. Tawney, Chairman of the House Committee on Appropriations, was right when he insisted on the Survey taking up this long-neglected burden; but work of such importance demands special funds instead of incidental provision from existing appropriations. It is well to be economical, but true economy dictates liberal support for those agencies which develop wealth.

In the plans for the coming year \$25,000 additional is estimated for geology, and it is understood that this is to allow the Survey to expand its work in the Western metalliferous districts. The sum is small in proportion to the work, but should make possible some additional parties as well as such increases in salaries as will at least delay the loss of good men to outside interests. A much larger sum should be available, but any experienced administrator will recognize, albeit at times regretfully, the need of making haste slowly in increasing expenditures on any work. Large and sudden increases provoke poor administration and waste, but we will hope that the sum asked for will not only be promptly granted, but be merely the earnest of annual increases so long as the needs of the work demand them.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. S. NOYES is in Oregon.
J. H. CURLE is on his way to Bokhara.
K. T. LEWIS has gone to Rawhide, Nevada.
FRANK W. GRAHAM, of Denver, is in London.
FRANK H. PROBERT is at Guanajuato, Mexico.
H. COLLEBRAN is in London on a visit from Korea.
VICTOR BRASCHI, of Mexico City, is at New York.
E. M. HAMILTON is at Ventañas, Durango, Mexico.
W. H. SHOCKLEY has returned to London from Siberia.
E. T. MCCARTHY has returned to London from Siberia.
GENARO ESCOBOSA has returned to San Días, Mexico.
N. SAMWELL, of Rangoon, Burma, is in San Francisco.
C. S. HERZIG was at Rawhide, Nevada, and has gone to Ely.

J. E. SPURR is examining mines in the State of Washington.

F. LYNWOOD GARRISON has returned to Philadelphia from Mexico.

S. E. BOLT is with the Arizona United M. Co., at Johnson, Arizona.

HENRY HAY left London on October 9, returning to Johannesburg.

P. C. JURS, of the Union Iron Works, was in Los Angeles last week.

LESLIE URQUHART is manager of the Kishtim copper mines, in Siberia.

H. C. HOOVER has returned to London from a flying trip to New York.

THEODORE J. HOOVER is at the Caucasus Copper Co.'s mines in Asia Minor.

W. E. THORNE is examining placer properties near Gold Creek, Montana.

GEORGE A. SCHROTER, of Denver, is at New York on professional business.

FREDEBICK A. KAUFMAN, of the United States of Colombia, S. A., is at New York.

GEORGE MACFARLANE represents Bewick, Moreing & Co. at Tarkwa, West Africa.

E. G. SPILSBURY is investigating Tonopah and vicinity for a New York syndicate.

ROBERT ALLEN has returned from Parral, Mexico, and will proceed at once to Johannesburg.

AUGUST MATHEZ, of Denver and Salt Lake, has opened an office at 42 Broadway, New York.

F. W. OLDFIELD is returning from Hostotipaquillo, Jalisco, Mexico, to Los Angeles, California.

ROBERT SMART, government assayer at White Horse, Yukon Territory, was in Seattle last week.

JAMES H. FOX, of Seattle, was recently examining properties in the vicinity of Baker City, Oregon.

WALTER G. PERKINS is expected in London on his return from the Tanganyika Concessions, in Central Africa.

F. CUSHING MOORE, mine inspector for Idaho, recently visited the active mines of Lemhi and Custer counties.

A. L. GLOVER has charge of the assay office and laboratory of the Oregon-Idaho Investment Co. at Baker City, Oregon.

I. F. LAUCKS, of Falkenburg & Laucks, Seattle, made an examination of mining properties in Chelan county, Washington.

HERBERT A. MEGRAW has taken the management of the Santa Elena mine, at San Luis de la Paz, Guanajuato, Mexico.

F. A. ROSS, late manager for the Daly Reduction Co., Ltd., Hedley, British Columbia, has gone to Hostotipaquillo, Jalisco, Mexico, in the interests of the Marcus Daly estate, which has the well known Cinco Minas under option.

Market Reports.

LOCAL METAL PRICES.

San Francisco, October 28.

| | | | |
|--------------------------|------------|--------------------------|---------|
| Antimony | 12-12½c | Quicksilver (flask)..... | 46½-47½ |
| Electrolytic Copper..... | 16¼-16½c | Spelter | 7½-8½c |
| Pig Lead..... | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|-------------------------|-------|----------|--------------------|
| Oct. 22..... | 12.68 | 4.21 | 6.37 | 50¾ |
| " 23..... | 12.62 | 4.21 | 6.40 | 50¾ |
| " 24..... | Sunday. No market. | | | |
| " 25..... | 12.62 | 4.21 | 6.40 | 50½ |
| " 26..... | 12.56 | 4.22 | 6.40 | 50 |
| " 27..... | 12.56 | 4.22 | 6.40 | 50¾ |
| " 28..... | 12.56 | 4.22 | 6.40 | 50¾ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Oct. 20. £ s. d. | Oct. 28. £ s. d. |
|------------------------|---------------------|---------------------|
| Camp Bird..... | 1 7 9 | 1 8 6 |
| El Oro..... | 1 5 7½ | 1 6 0 |
| Esperanza..... | 2 17 6 | 2 17 6 |
| Dolores..... | 1 10 0 | 1 8 9 |
| Oroville Dredging..... | 0 11 3 | 0 11 9 |
| Mexico Mines..... | 6 13 9 | 6 6 3 |
| Tomboy..... | 0 19 4½ | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. October 28. | Closing prices. October 28. |
|--------------------------------|--------------------------------|
| Amalgamated Copper..... | 83 |
| A. S. & R. Co..... | 96¾ |
| Boston Copper..... | 13¾ |
| B. C. Copper Co..... | 6¾ |
| Butte Coalition..... | 26¾ |
| Cumberland-Ely..... | 7½ |
| Davis-Daly..... | 5¾ |
| Dolores..... | 7¼ |
| El Rayo..... | 2¾ |
| Ely Central..... | 3¼ |
| First National..... | 5¼ |
| Giroux..... | 8¾ |
| Guanajuato Con..... | 2 |
| Inspiration..... | 6¾ |
| Kerr Lake..... | 8¾ |
| La Rose..... | 6 |
| Mason Valley..... | 17½ |
| Miami Copper..... | 157¼ |
| Mines Co. of America..... | ½ |
| Montgomery-Shoshone..... | 1¼ |
| Nevada Con..... | 24½ |
| Nevada Utah..... | 1¾ |
| Newhouse..... | 2¼ |
| Nipissing..... | 11 |
| Ohio Copper..... | 4¾ |
| Ray Central..... | 2¾ |
| Ray Con..... | 17¾ |
| Superior & Pittsburg..... | 16½ |
| Tenn. Copper..... | 48½ |
| Trinity..... | 10 |
| Tuolumne Copper..... | 3¾ |
| United Copper..... | 9¼ |
| Utah Copper..... | 47¾ |
| Yukon Gold..... | 47½ |

COPPER SHARES—BOSTON.

| Closing Prices. October 28. | Closing Prices. October 28. |
|--------------------------------|--------------------------------|
| Adventure..... | 47½ |
| Allouez..... | 55 |
| Atlantic..... | 10½ |
| Calumet & Arizona..... | 100 |
| Calumet & Hecla..... | 660 |
| Centennial..... | 78½ |
| Copper Range..... | 79 |
| Daly-West..... | 7½ |
| Franklin..... | 16½ |
| Granby..... | 95 |
| Greene-Canaan, etc..... | 11 |
| Isle Royale..... | 25¼ |
| La Salle..... | 14¾ |
| Mass..... | 5¼ |
| Mohawk..... | 59 |
| North Butte..... | 58 |
| Old Dominion..... | 60½ |
| Osceola..... | 164 |
| Parrot..... | 29¾ |
| Santa Fe..... | 1¾ |
| Shannon..... | 16¾ |
| Superior & Pittsburg..... | 16 |
| Tamarack..... | 65 |
| Trinity..... | 10 |
| Utah Con..... | 42½ |
| Victoria..... | 3 |
| Winona..... | 61 |
| Wolverine..... | 145 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, October 28.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 12 | Midway..... | \$ 16 |
| Belmont..... | 66 | Montana Tonopah..... | 85 |
| Booth..... | 11 | Nevada Hills..... | 71 |
| Columbia Mtn..... | 7 | Ophir (Comstock)..... | 1 80 |
| Combination Fraction..... | 61 | Pittsburg Silver Peak..... | 18 |
| Daly..... | 8 | Rawhide Coalition..... | 29 |
| Florence..... | 2.75 | Rawhide Queen..... | 29 |
| Goldfield Con..... | 6.75 | Round Mountain..... | 64 |
| Gold Keweenaw..... | 5 | Sandstorm..... | 4 |
| Great Bend..... | 3 | Silver Pick..... | 10 |
| Jim Butler..... | 12 | St. Ives..... | 9 |
| Jumbo Extension..... | 14 | Tonopah Extension..... | 50 |
| MacNamara..... | 27 | Tonopah of Nevada..... | 6.55 |
| Mayflower..... | 12 | West End..... | 22 |

General Mining News.

ARIZONA.

MARICOPA COUNTY.

A. J. Kellis and N. McCarver have located five claims covering a deposit of manganese 30 miles south of Wickenburg. The outcrop has been traced for 3000 ft., and samples taken near the surface assayed from 35 to 60% MnO_2 .—The St. Francis Mines Co. has installed a 25-hp. Fairbanks-Morse hoist at its property in the Wickenburg district. Living quarters for the men and the surface plant have been completed and considerable development is planned for the near future. George Morgan is superintendent.—The spur from Bouse to Swansea is completed to within a few miles of the town. The smelter of the Clara Consolidated at the latter place has been completed and will be blown-in as soon as the line is ready to carry freight.

MOHAVE COUNTY.

Operations have been resumed at the Neal property at Goldroad. Jacques de Salmard is in charge of the work.—A large body of milling ore has been opened on the 300-ft. level of the Southwestern Copper Co.'s mine at Copperville.—A. L. McLesson opened a shoot of rich ore on the 100-ft. level of the Holy Moses mine.—A number of samples taken from the Expansion group assayed from \$70 to \$160 per ton. The compressor has been moved from the shaft to the adit-level and the company is installing further mining equipment. C. J. Hutchison is superintendent. Mr. Hutchison and associates are to make a mill test on the ore from the property of Thomas Sickles south of Kingman with a view to obtaining a bond on the property.—At the Goldbug mine, in the Weaver district, north of Chloride, the shaft is down 500 ft. Cross-cuts are to be driven on the 400 and 500-ft. levels and drifts run on the vein.—The management is installing new electric equipment at the Tom Reed mine near Goldroad.—The electric power has been turned on at the mill of the Goldroad Mining & Milling Co., at Goldroad, and the stamps are now crushing ore. The bins are filled and a large amount of ore is piled on the dump. The management estimates that there are 400,000 tons blocked out above the 700-ft. level which has been opened for over 1000 feet.

PIMA COUNTY.

A raise is being driven in the ore from the 100 to the 60-ft. level at the Plumed Knight property in the Olive district. A stope will be opened shortly and the ore that assays over 7% copper, shipped to the smelter. L. D. Chillson is in charge of the work.—At the property of F. J. Villaescusa, in the Fresno district, on the west side of the Baboquivari mountains, a shaft has been sunk 50 ft. on a vein of free milling gold and silver ore.

PINAL COUNTY.

Operations have been resumed at the property of the Green River Copper Co., near Superior. Machinery has been ordered and will be installed at the mine within a short time. Kimball Pomery is manager.

YAVAPAI COUNTY.

H. L. Sweeney and S. H. Anderson have unwatered the 75-ft. shaft on their property six miles west of Prescott and are sinking on the vein which is 5 ft. wide.

YUMA COUNTY.

The Merry G. Mining Co. has been organized in Phoenix to open a group of claims near Winchester. A 25-ft. shaft has been sunk on the vein, samples from which have assayed \$26 gold and 106 oz. silver. J. P. Striegel is president of the company.

CALIFORNIA.

CALAVERAS COUNTY.

Frank Heath, of San Andreas, has secured the Montana mine for Eastern capitalists and will erect a 10-stamp mill on the property.—Five stamps are to be added to the Easy Bird mill.

MARIPOSA COUNTY.

(Special Correspondence).—An excellent find is reported

from the Mountain King mine near Bagby. The company has been developing the property for the last four years running the ore through a 10-stamp mill, and it is now probable that the milling capacity will be increased and a greater tonnage taken from the mine.—There are 20 stamps dropping at the Hite Cove mine, at Hite Cove, and the company plans to have 50 operating in the near future.—Considerable work is being done at the Egenhoff Brothers' property, known as the Clearing House mine, on the Merced river, and some good ore opened.—In the Hornitos district a number of old properties are being re-opened and the outlook for future mining operations is bright.

Bagby, October 25.

NEVADA COUNTY.

Operations are to be resumed at the Comlon mine, in the Grass Valley district, in the near future.—A new compressor and hoist have been installed at the Grass Valley-Dana mine which was recently taken over by the Nassau Mining Co., and the shaft is to be sunk to the 500-ft. level. Fred Godfrey is in charge of the work.—At the Kenosha



mine, near Grass Valley, the drift on the 400-ft. level opened a shoot of rich ore giving 120 ft. of backs.—The plant at the Delhi mine on the middle fork of the Yuba river near North Columbia, which was destroyed by fire last week, is to be replaced. Hamilton Eddie is superintendent.

SHASTA COUNTY.

Furnace No. 2 in the Mammoth smelter at Kennett has been shut down to install a settler similar to those at No. 3, 4, and 5. The company has commenced grading for the foundation of a bag house to eliminate the objectional fume from the smoke. The Shasta County Farmers' Protective Association delayed any legal action against the smelting companies till November 1 to give them time to find some relief from the fume, and the bag house is the result of this action.—Two miners at the Balaklala mine, at Coram, lingered in the mine after shooting and were suffocated by the powder smoke.—The well of the Bella Vista Oil Co., at Bella Vista, is down over 110 ft., and has cut a 6-in. stratum of oil-bearing sand.—The mill of the Western Exploitation Co., operating the Milkmaid mine at French gulch, is again in operation.—The drift at the Spread Eagle is in 62 ft. and the company is preparing to make a shipment to the Selby smelter.—The Appellate Court has sustained the decision of the lower courts in the Harrison gulch townsite case, giving the ground in dispute at Harrison gulch to the Victor Mining Company.

SIERRA COUNTY.

The Gibraltar gravel mine, near Downieville, has been shut down and will not be in operation till next spring.—A 9-in. vein containing considerable arsenical pyrite and free gold was opened on the Bovee property near Alleghany. At the Twenty-One mine, in the same district, a rich shoot was cut on the adit level.—The South Fork Mining Co., operating the Amethyst property, has opened a good shoot of ore in the drift from the bottom of the shaft.—The new mill, at the Chipps mine, is practically completed and will be started the early part of November.—The raise at the Omega is in gravel that runs \$5 per car.

TUOLUMNE COUNTY.

The shaft at the Trumper property is down 40 ft. on the vein.—At the Gold Spring mine, between Sonora and Jamestown, a new hoist has been installed and two machine-drills are running in the shaft which is down 60 ft. The vein is 30 ft. wide and assays from \$3 to \$18 per ton.—The new 5-stamp mill, erected by J. T. Callahan, at Big Oak Flat, is completed and will be in operation as soon as connection can be made with the power line. The mill is designed to handle the ore from the Eureka mine but will accept custom ore from the neighboring properties.—The Golden Dawn mine near Soulsbyville, owned by R. A. and John Nicholls and Thomas Webster, is to be re-opened shortly.—At the North Fork Consolidated Mines Co. property, near Arastraville, the shaft is down 50 ft. Work has been stopped temporarily on account of the power being turned off and it is probable that the company will install a gasoline power plant.—The Tuolumne Mining & Development Co. has bonded 80 acres of gravel land near Columbia and will prospect it to determine its value as a dredging property.—A diamond-drill is to be installed in the Dutch mine, at Quartz, to prospect the lower levels. Chas. H. Stregerson is in charge of the work.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A 7-in. streak of smelting ore has been opened in the Bellmont property on Saxon mountain that assays 758 oz. silver, 0.03 oz. gold, and 62% lead.—The concentrating mill at the Wilcox adit is being run on one shift and from 80 to 90 tons of ore is being crushed per day.—At the Tobin adit 26 men are at work. There is ready for shipment over 600 tons of smelting ore that is worth from \$45 to \$50 per ton in gold, silver, and copper. Stopping is in progress and for a length of over 500 ft. a body of ore is exposed that is from 1 to 5 ft. wide. Operations are being centered principally on the Wheeling vein.—The Linn mill is now running day and night on ore from the Mineral Chief mine, on Democrat mountain. An average of 100 tons of zinc and 120 tons of lead concentrate is being sold monthly. The zinc concentrate mills 58% in zinc, while the lead contains 62.80% lead and 15 oz. silver per ton. C. E. Pughe is manager.—A meeting of the stockholders of the Georgetown M. P. & T. T. Co. was held this week at which time the capitalization was increased from \$1,000,000 to \$5,000,000. A big campaign of development is to be put under way at once.

Georgetown, October 23.

(Special Correspondence).—Extensive development is being carried forward at the holdings of the North American Mining & Smelting Co., on Donaldson mountain. Fred Nye, the manager, is opening large reserves of ore in the drift being run on the Magnolia vein, while the Donaldson drift is being driven on a body of medium-grade ore that is from 16 to 30 in. wide. Throughout the various workings of the property large bodies of ore are showing and within a short time it is hoped to have the holdings in condition whereby the output that can be made will warrant starting the furnaces of the pyrite smelter at Golden, which the company recently purchased for a consideration of \$150,000.—The Burns-Moore adit on Chicago creek is being driven steadily forward. A force of men was put to work last week in driving one of the laterals for intersecting a number of cross veins.—The Honest John M. M. & T. Co. is employing a force of men in the development of the Black Eagle mine, on Chicago mountain.—The pumps of the

Stanley mine were started this week to unwater the shaft which has been filled for the last four years. There are five miles of underground workings in the mine, all of which are filled with water. It is expected that the water will be down to the fourth level inside of 60 days, at which time men will be put to work in the various stopes. This property was one of the former heavy producers of the district, being credited with over \$1,000,000. Jas. Bowden, who was in charge during the early operations, has been re-appointed general manager.

Idaho Springs, October 23.

GILPIN COUNTY.

(Special Correspondence).—The Newhouse adit has intersected the Gibson vein, which is supposed to be an extension of the California. It is 7 ft. wide, of which 18 in. is smelting ore, and was cut at a vertical depth of 1600 ft. R. W. Miller, of Nevadaville, is manager.—Two carloads of 2-oz. gold ore were shipped last week from the Two-Forty mine, in Willis gulch, the product being delivered to the Modern smelter at Utah Junction. Hereafter the ore will be sent over the Gilpin tramway from the main shaft, as a side track has been put in to connect with the main line.—Joseph Ross & Co., leasing on the 500-ft. level of the Iron mine, on Pewabic mountain, have opened a large body of ore, both of a smelting and concentrating grade. The smelting streak is from 14 to 16 in. wide, and assays over 2 oz. gold per ton.—Shipments of both smelting and concentrating ore are being maintained from the Egyptian mine on Quartz hill. The first-class product mills \$100 gold per ton, while by reducing from four to five tons to one the concentrate is worth from \$80 to \$90 per ton.—A 4½-ft. vein was cut



Gregory-Buell Mine.

on the 1400-ft. level of the Gregory mine, 12 in. of which is smelting ore that assays 12 oz. gold and 24 oz. silver per ton, with 20% in copper.

Central City, October 25.

LAKE COUNTY.

McCarthy, Dunn & Casey have secured a lease on the Little Alice and Eliza claims, near Leadville, and will sink a shaft on the property.—Twenty-five tons of ore is being shipped from the Silent Friend mine in South Evans gulch.—A new pumping plant has been installed at the Blanche mine and sinking resumed.—The shaft at the Highland Mary, on Breece hill, is down 100 ft. and drifts started on the vein.—The winze in the St. Louis tunnel is down 100 ft. and will be sunk to the 250-ft. level. The vein is now 3½ ft. wide and assays \$40 per ton.

OURAY COUNTY.

The winze on the lowest level of the Frank Hough mine in the Ouray district opened a body of rich copper ore.—A drift is being driven from the raise at the Thistledown property to get under the face of the adit, where a connection will be made with the latter.—Living quarters have been erected at the Free Gold group, in Poughkeepsie gulch, and work will be continued all winter.—The management of the Treasury tunnel at Red mountain, which has now been driven over a mile, has laid in supplies for the winter and is raising on one of the shoots cut near the face of the tunnel.—At the Atlas mine the drift to connect the Atlas and San Pedro workings is the main development and is furnishing ore to keep the mill running steadily.

SAN JUAN COUNTY.

The Hercules Consolidated Mining Co. has resumed operations at its property on Sultan mountain at Silverton.—A carload of high-grade ore has been sacked for shipment at the Shamrock group above Animas Forks.—Twenty cars of rich copper ore was shipped to the smelter from the Highland Mary near Silverton.—A force of nine men is working at the Gold Bug mine of the Syndicate Gold Mining Co., in the western part of the county. The company recently shipped four cars to the smelter at Durango. Martin Tulley is manager.—The mill and tramway at the Gold King mine, near Gladstone, have been repaired and the mill is running night and day. The company has erected new dwelling quarters for the men at the mine and an office in Gladstone.—At the Gold King Extension an adit is being driven that will open the vein at a depth of 1000 feet.

SUMMIT COUNTY.

T. E. Shaw has secured a contract to erect a \$126,000 hydraulic plant at the property of the Buffalo Placer Mining & Milling Co., near Dillon. There are 1840 acres in the property which is in charge of Lemuel Kingsbury.—A contract has been let for 500 ft. of cross-cutting at the Excelsior mine.—A contract has been awarded to drive the Mary Verna tunnel 500 ft. The present face is 3400 ft. from the portal.—The mill at the White Cloud is running on a good grade ore from the mine. A. A. Pike is superintendent.

TELLER COUNTY.

By the payment of \$45,000 Allen L. Burris completed the payment of an option on 72,500 shares of the El Paso Consolidated Gold Mining Co. of which he is president. The option price of the stock was 80c. per share and 20c. of this had been paid upon the taking of the option.—The Colorado Mines Investment Co. has resumed operations at the American Eagles mine on Bull hill, and has let a number of sub-leases. Paul Hines is superintendent.—The Rubie Mining & Leasing Co. has resumed work at the Rubie and Lafayette mines of the Princess Alice Gold Mining Co.—Sherman M. Bell has secured a two-year bond on the Janet W., Laura M., and Lester W. claims, on Beacon hill, from the Republic Gold Mines Co.—The Isabella Mines Co. has leased the Empire State workings to T. R. Burbridge on a graded royalty basis for two years.—The return on a trial shipment from the Sunshine mine on Galena hill amounted to \$42 per ton. Fred Kreutzer, who is operating the property under lease, is stoping on a 4-ft. vein.—A heavy flow of water was cut in the heading of the Roosevelt Deep Drainage tunnel, the amount being estimated between 400 and 500 gallons per minute. The average progress is from 15 to 16 ft. per day.—High-grade ore is again being shipped from the Crescent mine on Womack hill.—Chas. Anderson and associates, operating the Dexter property on a sub-lease, have opened a flat vein on the 800-ft. level that assays from \$12 to \$30 per ton.—The structural steel work for the new mill of the Portland Gold Mining Co. is nearly complete, and the machinery is on the ground. It is expected that the plant will be ready for operation by the first of the year.

IDAHO.

BOISE COUNTY.

(Special Correspondence).—At Quartzburg the 20-stamp mill of the Gold Hill & Iowa Mines Co. is being moved from its former site to the Gold Hill shaft, where it will be reconstructed and some new equipment will be added. Electric power is being provided for. E. E. Carter is manager.—The Edna mine, 24 miles northwest of Idaho City, in charge of C. R. Watson, is a silver property, which has been equipped with a plant for cyaniding the ore by a process similar to that in use at Pachuca, and Guanajuato, Mexico. Quartzburg, October 25.

CUSTER COUNTY.

(Special Correspondence).—The Greyhound mine, near Stanley Basin, is in charge of Steven Smith, who has the property equipped with a 10-stamp mill and round water-jacketed smelting furnace, of 40 tons capacity. The settled slime is being briquetted. The mill has been started but not the smelter.—The Sunbeam mine, of which Werner Ziegler is superintendent, yields a medium-grade gold and

silver ore in a rhyolite gangue. Until recently two Monadnock mills have been in operation, but work is now suspended while additional machinery is being installed. It is reported that four Chilean mills are to be installed. A hydro-electric power plant is being constructed on the Salmon river, 12 miles from the mine. The latter plant is to be finished this fall.—The Lost Packer, situated in the northwestern part of the county, is being further developed under the superintendency of J. P. Boyle. The vein is in schist country rock and is intersected by several porphyry dikes, making it difficult to follow. An 800-ft. cross-cut, which is nearly finished, will cut the ore at a depth of 1000 ft. This is chalcopryite and assays high in gold. The smelting plant, erected on the property two or three years ago, has not been operated this season. The mine is 130 miles from Mackay, the nearest railroad station.

Mackay, October 23.

LEMHI COUNTY.

The Pittsburg & Gilmore railroad, being built from Armstead, on the Butte branch of the Oregon Short Line, to the mining districts of Lemhi county, will probably be finished as far as Junction by January 1. Later an extension is to be made to the Gilmore mine at Gilmore, and the company contemplates a further extension from Junction down the Lemhi river to Salmon City. The Gilmore mine is opened by a 400-ft. vertical shaft, and has a large amount of lateral development.—The Kittle Burton, in charge of R. L. Edwards, is situated at Ulysses, where a 2000-ft. Leschen tramway has been erected. Re-grinding machinery is to be installed in the 15-stamp mill, increasing the capacity to 100 tons per day. This is 30 miles north of Salmon City.

ILLINOIS.

In the Sandoval oil field there are now five producing wells. Drilling throughout the western part of the State is active. Developments at Du Quoin are watched with especial interest as the geological structure there is known to be favorable.

KANSAS.

CHEROKEE COUNTY.

There are many features of improvement in the Baxter Springs camp. There are two tendencies in that field which will probably mean a betterment of the conditions there, the buying of the land by the operating companies and the enlargement of the mills with installation of careful sizing systems. New laws make it possible now for the Indian owners to sell the lands and the operators are taking advantage of the opportunity.—The Mission company is erecting a new 500-ton plant and is operating the old small one while the work is in progress. The company is working a thin deposit of ore, milling about 4%. The Mason company has enlarged its plant to 250 tons and is installing Foust jigs.—Pittsburg men have taken over the Sweeney mill and after a general overhauling and installing of new jigs have started operation. The ore runs about 4%.—A new company has begun prospecting in the Cave Springs camp south of the Herald mine, hitherto the sole producer of this field. The company has cut ore from 85 to 150 ft. The ore is mainly zinc blende.

Baxter Springs, October 22.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—Perhaps the most prominent feature of the Joplin district at present is the development of new fields on the outskirts of the older camps.—In the Chitwood camp there are five or six drills busy on the Granby land. The same company has a number of men prospecting west of the main Spring City camp.—A recent find of rich shallow ore in the Carl Junction camp at a depth of only 3 ft. has caused a great rush to that camp and a demand for leases on the Bristow land.—The Cunningham land, southeast of Duenweg, has been laid off in acre lots and is to be leased for mining purposes. The property lies in the deep sheet ore belt.—Henry Crossman has secured a lease southeast of the Duenweg and has installed a drill to prospect it.—One of the best of the newer fields

is the Van Hoose 40 acres, north of Neck City, recently sold to St. Louis capitalists. Upon this land three companies are planning the early erection of mills.—The old Boston-Get There mine, in the Prosperity camp, is being rejuvenated after an idle period lasting some years. The old American Beauty 300-ton mill No. 2 is to be removed to the new tract. This was one of the first sheet ground mines in the camp.—The old Florence, at Midway, has been taken over by a new company and is now called the Green Dog.—The Overland mill, at Duenweg, has resumed operation after a two-year shut-down.—The Little Pearl on the Continental land west of Joplin has made a good find of lead ore in a drill-hole at 98 ft. continuing to 108 feet.

Joplin, October 22.

NEVADA.

CHURCHILL COUNTY.

(Special Correspondence).—The Nevada Hills is preparing to exploit the rich shoot recently opened below the barren zone in the vein. A 40-hp. gasoline engine has been ordered to operate the compressor, and steady shipments are being maintained. W. H. Webber is manager.—The Fairview Eagle is sinking from the 200-ft. level and shipping ore.—The Nevada-Fairview, operated by lessees, has purchased a 50-hp. gasoline hoist and small compressor.—A vein of ore said to run from \$20 to \$60 per ton in gold, silver, and copper, is being opened on the Nevada Crown. Fred Young is manager.—Lessees on the Dromedary Hump and Golden Boulder have installed hoists and are opening good veins.

Fairview, October 21.

ESMERALDA COUNTY.

Dividend checks, amounting to \$1,067,000, will be distributed to the Consolidated stockholders on October 30. The company is installing six Chilean mills in the Consolidated plant which will bring the output up to 900 tons per day.—A bunch of \$200 ore was opened in a stope on the 125-ft. level at the Daisy property.—The shaft at the Goldfield Annex is down 540 ft. in the dacite formation. The company is to sink to the 1000-ft. level and cross-cut.—Mitchell & Fairfield have secured a bond on the Blair No. 2, Four Timer, Daisy, Gold Bar, and Alamo claims at Silver Peak for \$75,000.—The operators of the Diadem lease, at Diamondfield, are sacking rich ore for shipment.

NYE COUNTY.

(Special Correspondence).—Exploration work of the Tonopah Mining Co. is practically confined to the lower levels of the Mizpah, Silver Top, and Red Plume, while the bulk of production continues from the old workings. The weekly bullion shipments are averaging about \$49,000.—The Belmont shaft has passed through the wet belt and entered the dry andesite at a depth of 780 ft. At the 1100-ft. point in the old workings a station is being cut from which a three-compartment shaft will be raised to meet the Belmont shaft.—The Tonopah Extension is rapidly proceeding with the erection of its new mill.—The Toquima Mining Co., of Boston, has taken over the Round Mountain Power & Water Co., Solid Gold Mining & Leasing Co., the Sierra Power & Water Co., and a controlling interest in the Round Mountain Daisy Co.—It is announced that the Sphinx mine and mill will resume operations within a few weeks.—The War Eagle Mining & Milling Co. has commenced excavation for a sampler at Manhattan. The manager promises to have it in operation before the end of the year.—The Johnnie Mining & Milling Co. has placed an order for a 10-ft. Chilean mill. Sixteen Nissen stamps are now in operation. E. Price Mitchell is manager.

Tonopah, October 22.

STOREY COUNTY.

(Special Correspondence).—The north drift on the 2450-ft. level of the Consolidated Virginia is being re-timbered and this portion of the mine will be thoroughly developed.—It is reported that the new vein on the 2300-ft. level of Mexican assays \$65 per ton. The winze from the 2000 is down 230 ft.—The output at the Ophir has been increased to 300 tons per week. On the 2000-ft. level a good vein of \$19 ore is being opened.

Virginia City, October 22.

WHITE PINE COUNTY.

At the Millard claim, near Lane City, the lessees are mining ore from a 3-ft. vein and shipping to the Salt Lake plants.—The adit at the Duzette group cut a 20-in. vein of lead ore at a depth of 175 ft. John Steele is in charge of the work.—A consolidation is to be made between the Nevada Consolidated and the Cumberland-Ely companies of their properties at Ely. This will result in the active exploration of the Cumberland-Ely ground and a more economical treatment of the ores at Smelter.—The old shafts that were sunk on the Clipper and Monarch claims of the Ely Central in early days have been cleaned out and some excellent copper ore found. Edward Hoffman is consulting engineer.

OREGON.

BAKER COUNTY.

(Special Correspondence).—The Indiana Mining Co., with offices in Baker City, has done 6000 ft. of development on its property 20 miles northeast of Baker City. There are two veins, 200 ft. apart, in altered rhyolite containing 5 to 6% copper, and \$3.50 per ton in gold and silver. They are opened from a 375-ft. shaft, there is 5000 ft. of development on the 300-ft. level.—The Rainbow mine, in Mormon basin, belongs to the Commercial Mining Co., for which W. E. King is manager. A 20-stamp mill is being run on a good grade of ore. It is reported that they have one ore-shoot 10 ft. wide, and 129 ft. long, sampling \$26 gold per ton.—The Humboldt Gold Mining Co., owner of the Humboldt mine, also in Mormon basin, is controlled by James A. Howard and associates of Baker City. Forty-five tons per day is being milled in a 10-stamp mill equipped with plates and concentrators. The saving on the plates amounts to 60% of the assay value, the balance being saved in concentrate. The tailing assays 80c. per ton. The ore assays from \$8 to \$150 per ton. The total development measures 4000 ft. Five additional stamps will be installed next spring.

Baker City, October 26.

JACKSON COUNTY.

(Special Correspondence).—The Grey Eagle mine, belonging to the Oregon-Gold Hill Mining Co., of Portland, has installed a 10-stamp mill and cyanide plant, which is expected to be in operation by December 1. They have a steam power plant but electricity will be installed later. The processes will consist of amalgamation, concentration, and cyanidation. They purpose cyaniding the concentrate as well as the table tailing. J. R. Wolfe is general superintendent. The mine is six miles north of Gold Hill.

Gold Hill, October 25.

TEXAS.

PRESIDIO COUNTY.

(Special Correspondence).—Attention is being attracted to the Shafter mining district by the prospecting and development work that is now going on there. A rich vein of silver-lead ore was recently opened up there by Young Brothers, of El Paso. Regular shipments of ore are being made from this property to the smelter and the returns are said to be large. This new mine is situated near the famous silver-lead mine of the Cibola Mining & Milling Co. which has been a steady producer for 25 years and is said to have yielded about \$6,000,000 during that period. The Shafter district is situated 40 miles from Maria, the nearest railroad shipping point. Several other promising claims in that district are being exploited and it is expected that a number of them will be developed into good shipping properties before a great while. The question of building a railroad into the district is being agitated.

Shafter, October 22.

UTAH.

BOX ELDER COUNTY.

Operations have been resumed at the Century mine of the Century Gold Mining & Milling Co., in Park valley. There is a good mill on the property which is credited with a production of \$212,000. Patrick Sheahan is in charge of the work.

JUAB COUNTY.

The new three-compartment shaft at the Lower Mammoth

property will be finished to the 2000-ft. level about November 1 when the company will cross-cut to the ore.—The Guggenheim interests have purchased the Woodman group in the Deep Creek district for \$280,000. A 50-ton mill is to be erected on the property within the next three months.—Operations at the Grutil mine, in East Tintic, were suspended for a few days on account of an accident to the hoist.—A carload of ore per week is being shipped from the Ajax mine at Eureka. The shaft will be sunk to the 1300-ft. level.

SALT LAKE COUNTY.

(Special Correspondence).—W. H. Janney, superintendent of the Copperton mill of the Utah Copper Co., has patented and put into use what he calls a pulp extractor, for discharging the concentrate from the vanner boxes. It consists of a spiral shaft, set in the bottom of the V-shaped vanner box, where it turns at about 35 revolutions per minute. It is in reality a screw conveyor, operated by the vanner gearing. Its working creates little or no agitation of the pulp and slime, thus not interfering with the settling of the particles. Allowing a vanner box to fill, this conveyor can be set in motion and made to discharge the accumulated concentrate in 15 to 20 minutes. Mr. Janney states that this device may be applied in discharging the pulp from V-shaped settlers and pulp-thickeners.

Bingham, October 24.

SUMMIT COUNTY.

The Iowa Copper Co. has stopped shipping from its mine at Park City for the winter as the expense of hauling during the winter months is excessive. Development will be continued throughout the wet season and shipping resumed in the spring. A. M. Spooner is manager.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—At the annual meeting of the Consolidated Mining & Smelting Co., of Canada, Ltd., held in Toronto, October 12, the capitalization of the company was increased from \$5,500,000 to \$7,500,000. During the past year the company has augmented the plants at its different mines at a cost of \$164,951; the amount expended on new mines acquired was \$55,766; land at Trail, \$22,070, making a total of \$242,787. This sum was derived from the company's operating profits. The operations of the Consolidated company for the past year show a profit of \$329,000. This figure is arrived at after writing off \$153,218 depreciation; \$16,650 for sundry items; \$24,444 working costs on Richmond-Eureka venture; and \$563,413 expended in development. The figures shown in this annual report indicate marked progress, especially where the Trail smelter and refinery and the Rossland mines of the company are concerned. At the Centre Star group here the output was the heaviest that it has been since the Consolidated company took hold, the gross value being nearly \$2,000,000. The mines are in good working condition today and with large ore reserves blocked.—The lessee of the Velvet-Portland group has got a small force of men at work about the property.—The B. C. Mining & Development Syndicate, of Rossland, has a small force at work on its property near Marysville.—The annual report of the Granby Consolidated M. S. & P. Co., for the year ending June 30, 1909, which has just been made public, is quite a favorable one when the many different drawbacks are considered. The gross earnings of the company for the year amounted to \$3,983,536 while the net profits were \$681,134, or 17% on the total earnings. The total mining, smelting, converting, and marketing charges per ton were \$3.20, which, after deducting gold and silver, made the cost price of copper to the company 10c. per lb. which was 0.0024c. lower than for the preceding year. Owing to large quantities of ore being caved during the year the grade was low, the average extraction being 21.81 lb. copper, 0.2724 oz. silver, and 0.0434 oz. gold per ton. The difference in grade of ore, however, is more than offset by the saving in mining costs when the run of the stopes is put through the smelter. During the past year this company paid \$270,000 in dividends, and has on hand in cash and copper a total of \$600,459. The average price obtained for copper during the year was \$13.22, and

for silver, \$51.25, which was a little lower than during the previous year.—The work of the Canadian Geological Survey in the platinum fields of the Tulameen district has been finished for the year and Chas. Camsell, geologist, who had charge of the work, has taken with him to Ottawa specimens and data that will furnish much work in the laboratory during the winter months. Considerable platinum has been found in the alluvial wash of the rivers of this district, and it is hoped that the researches of the Geological Survey will aid in placing the mining of this metal in this district upon an economical and profitable basis.—Ore shipments from the Sardon district have been light owing to the railway being damaged by a slide, but it is anticipated the Canadian Pacific will be ready to take ore from the Sardon mines in a week or ten days and it is expected that the shipments will be quite heavy until the ore now in storage is taken away.—The Canadian Marble Co., of Nelson, is expending \$150,000 on a plant for its quarries at Marblehead. About 70 men will be employed when running full force.—The output of coal at



Centre Star Mine.

the mines of the Crows Nest Pass Coal Co. increased heavily during the last few weeks.

Rossland, October 21.

CHILE.

The Braden Copper Co. of New York has just purchased 106 Frue vanners for its new concentrator. The machinery is being shipped to Valparaiso.

COLOMBIA.

The Gualcala Mines Co. of New York and Colombia has purchased a sectionalized mill for its mine in the latter country. The ten stamps, tube-mill, and cyanide plant are sectionalized to a 200-lb. limit.

MEXICO.

OAXACA.

(Special Correspondence).—At the Esquadra mine at Taviche the company is stoping on a 3-metre vein that assays $1\frac{1}{2}$ kg. silver per ton with a small amount of gold. Local capitalists have secured an option on the property.—A main working shaft has been started at the Andes-Bullion mine.—Ground has been broken for the foundation of a new 10-stamp mill at the Soledad mine in the Totolapam district. The mill will consist of two 5-stamp batteries, a tube-mill, and a cyanide plant.—A. E. Place has completed the sampling of the old Sorpresa mine belonging to C. T. Young.—A mill consisting of an Allis-Chalmers 5-stamp battery of 1050-lb. stamps, a 16-ft. amalgamating table, Overstrom concentrator, and a Frue vanner, has just been completed for the Rio Seco Mining & Milling Co., near the Parian station on the Mexican Southern railroad. George W. Edmund is superintendent.—At the Iowa mine in the Taviche district, sinking operations are being continued in the main workings, and a cross-cut is being driven on the 100-ft. level.

Oaxaca, October 19.

Special Correspondence.

NEW YORK.

Nevada Con.—Cumberland-Ely Consolidation. — Copper Stocks and Metal Prices.—La Rose Directors Chosen.—Lewisohn Silver and Copper Mines.—Guanajuato Changes.

Undoubtedly the most important event in mining circles during the week in New York was the consummation of the plans to merge the two premier copper companies at Ely, Nevada. There has been a vast amount of discussion and conjecture as to the terms upon which the merger would finally be made. It was said at first that the larger interests in Nevada Consolidated were insisting upon a basis of $3\frac{1}{2}$ shares of Cumberland-Ely for one of Nevada Consolidated. The minority interests in Cumberland-Ely were evidently strong enough to force a compromise and the call as issued for the stockholders' meeting to be held November 2, gives the basis of the intended exchange at $3\frac{1}{4}$ shares for one. The Nevada Consolidated will, upon ratification by the stockholders, issue 400,000 shares of new stock to be exchanged for the 1,300,000 of Cumberland-Ely. So far as the market is concerned the effect of the merger has been entirely discounted and while both issues, in common with the rest of the market, have ruled fractionally higher for the week, there has been no great activity in them. Some of the other Ely issues have been quite the centre of attraction. Some spectacular advertising has been put out to advance Ely Central, with the result that that part of the public which gives greater consideration to market quotations than to mining probabilities and ore reserves, has been loading up heavily with the shares. Ely Consolidated has also been dragged out of obscurity, where the tired holders, who largely refused to pay the two assessments levied against the shares, were quite content to allow it to rest, and has been moved up in price from the point of default for non-payment of the assessment to 65c. per share. Many of the other low-priced Ely stocks in which there has been no activity for months, have come to life on the strength of the market being made through publicity campaigns and a small sized boom in Ely stocks seems fairly under way. The leader in copper stocks outside of the Ely shares has been Tuolumne, which, while the volume of trading has been comparatively small, has the centre of attack by a large and growing short interest in the Street. In the face of pressure the stock moved up and seems to more than hold its own on the strength of its public support. The shares have been recently listed in Boston, and Boston houses have been doing quite a little in the way of arbitrage.

There were some unexpected changes made at the meeting of the board of directors of the La Rose Consolidated Mines Co. on Wednesday. John McMartin, Duncan McMartin, Henry Timmins, and Frank W. Holmes resigned as directors and their places were filled by the election of George W. Stevens, Shirley Oglivie, Alexander Pringle, and Victor E. Mitchell, all of Montreal. The gentlemen who resigned were pioneers in the Cobalt field and were interested in many properties when its future was wholly problematical. It is supposed that the changes are connected with the recent drive which was made against La Rose in the New York market, though just what the connection is has not, as yet, appeared. The present board of directors, through the president of the company, D. Lorne McGibbon, has given out a statement that the changes were made at the request of some of the largest holders and the present board had assumed responsibility only after a full examination of the physical condition of the property, as well as the financial status of the company, and finding both to be wholly satisfactory.

The copper metal market remains unchanged. Buyers have become exceedingly cautious and such sales as are made are not enough to give the market any buoyancy. The report of the Copper Producer's Association, made public last week, showed an additional accumulation of surplus copper, and had its effect upon buyers, causing

them to feel no haste as to purchases for future delivery.

The growing talk of a copper combine has reached such proportions that it is now dignified by explicit and repeated denials from the various interests said to have been actively considering the matter. The denials are really of little moment. Some kind of an organization is inevitable.

The Silver Mines Exploration Co., a Lewisohn organization operating in Canada, has declared its regular quarterly dividend of $1\frac{1}{2}\%$, with an extra 1%. The control of the Kerr Lake, a large interest in Otisse, as well as the other interests of the Lewisohns in Canada, are held and managed through the company. The General Development Co., the Lewisohn holding company through which the Miami Copper Co. and several other copper properties in the Southwest are operated, has just received the report of Walter Harvey Weed on the Ray Central Copper Co. Mr. Weed's report shows some 2,700,000 tons of ore in reserve above the 200-ft. level averaging between 2 and $2\frac{1}{2}\%$ in copper.

Negotiations are on for the taking over of the Jesus Maria mine, of the Guanajuato Amalgamated Gold Mines Co. by the Oro Grande mines controlled by the Securities Corporation, Ltd., of New York. The Oro Grande wants the Jesus Maria mill for its unequipped properties in the La Luz district. The Proprietary Mines Company of America announced this week that it had purchased a large block of stock giving it control of the Mineral Development Co., operating the Nueva Luz mine at Guanajuato, Mexico.

TORONTO, CANADA.

Output.—Stock Market.—La Rose Fluctuating.—Silver-Leaf.—Gowganda.—Geological Work.—Western Zinc Smelting.

Cobalt ore shipments for September amounted to 2505 tons, which showed a slight falling off as compared with those of August, and a large decrease in comparison with the 3049 tons shipped in September, 1908. The returns for the first nine months of the year, however, showing a total of 23,116 tons, indicate a substantial advance over the corresponding months of 1908, when the shipments amounted to 17,027 tons. The Wettlaufer, a South Lorrain mine, figures in the list for September for the first time with a consignment of 25 tons.

The stock market has been unsettled, with a decided preference for the dividend-paying stocks and continued weakness of the cheaper issues. This feeling is largely attributable to the litigation between the Nova Scotia and Peterson Lake companies, involving also a suit for a large amount brought by the Peterson Lake against J. A. Jacobs and E. M. Steindler, former officials of the latter company. Into the complicated charges and countercharges it would not be profitable to enter, but the determination reached by the shareholders of the Peterson Lake at a general meeting held here on October 6, to reject the overtures of the Nova Scotia and of Messrs. Jacobs and Steindler for a settlement by arbitration, and to push the litigation to the bitter end, has done much to weaken public confidence and to depress Cobalt securities. The surprise of last week, however, was the totally unexpected and still unaccounted for slump in La Rose, which fell from about \$7.50 to a little over \$6. It has since been slowly recovering and all sorts of rumors have been afloat as to the decline. The drop was remarkable owing to the company having the previous week made a record shipment of 225 tons of ore, while its consignments for the month of September headed the list with 620 tons. It is stated in some quarters that the company is drawing too extensively upon its reserves and diminishing the quantity of ore blocked. An authoritative statement as to the actual condition of the mine will be necessary in order to restore confidence.

The property of the Silver Leaf has been leased to the Crown Reserve for five years, subject to a renewal for another five. The Crown Reserve is to pay a royalty of 25% on the output for the first term which is to be raised to 35% should the time be extended. The leasing company also undertakes to spend \$20,000 the first year and \$10,000 for each succeeding year of the term upon the property. On the Silver Leaf has been discovered a new vein 5 in. wide

yielding high-grade ore at the 100-ft. level. At the Cobalt Lake, while driving was being done on the vein near the McKinley-Darragh, a 3-in. calcite vein at right angles to the drift was found, and it has proved to be rich in silver. The Prince, adjoining the Temiskaming, has been purchased by an American syndicate headed by Colonel Bunker, president of the Badger mine, for a high figure. The annual statement of the Kerr Lake Mining Co. for the year ending August 31 is of a highly satisfactory character. The net earnings amounted to \$1,129,047, and the company paid dividends during the year to the amount of \$480,000. The average monthly output of silver was 227,387 oz., being a total yield of 2,668,648 oz. from 1072 tons of ore averaging 2489 oz., and 600,000 lb. of screenings. The cost of producing was 12.38c. per ounce. Some rich ore is being taken on the Wettlaufer, in South Lorrain, at the 110-ft. level. Several of the samples estimated to carry over 8000 oz. have been placed on exhibition at Haileybury.

The road from Elk Lake to Gowganda, which was expected to afford a means of communication during the winter, will not be finished this season. The development of the camp is interfered with owing to the difficulty of getting in machinery and supplies. An important strike has been



Cobalt Before the Fire.

made at the O'Kelly mines. A large silver-bearing vein was discovered some months ago which has been stripped 800 ft. Stringers were met running from this vein, one of them so rich that a test pit was put down. At a depth of 8 ft. the vein had widened to 3 in. and was found to be high-grade ore.

The Bureau of Mines has been actively conducting explorations during the season which are likely considerably to extend the boundaries of the known silver-producing area. The Gillies Limit, lying to the south of the properties already sold, has been examined, and the geological formation found to be similar to that of Cobalt which encourages the expectation that valuable discoveries may follow a closer investigation. W. G. Miller, Provincial Geologist, is now making an investigation of the Gowganda district.

Overtures have recently been made by Western men to the Dominion Government, with a view to having the zinc industry in the Nelson district placed on a bonus basis, somewhat similar to the present status of the lead industry. The zinc question has been a hard nut to crack in recent years, owing to the fact that many of the lead mines have practically developed into zinc mines as the work progressed in depth. The Nelson electric zinc smelter has proved a success commercially, but at present is closed for lack of funds. The capacity of the present plant is 10 tons per day, but this should be increased to 30 tons, and there is a movement for the raising of funds to go on with the work.

SALT LAKE, UTAH.

Heinze Coming West.—Smelters Want Ore.—Slime Process at Mercur.—South Utah Mines.—Ray Con. Gets More Ore.—Majestic.

F. Augustus Heinze has left New York for the West. He will go first to Butte and then come to Utah, to confer with the managers of Ohio Copper, Bingham Mines, and Western Utah Copper. The Ohio Copper mill is nearing completion. The matter of giving a contract for the smelting of Ohio concentrate will be taken up while he is here. The Garfield, United States, and International are all anxious to secure the copper output for their furnaces. Both the lead and copper smelting companies in Utah are reaching out for tonnage. The two lead smelting companies are receiving heavier shipments than six months ago, but still could treat almost 50% more. They have offered special inducements to the producers in every section, but the low price of metals prevents some of the larger concerns from increasing production. It is claimed that the United States company is in no hurry to re-build its copper furnaces at West Jordan, as there is not enough ore coming into the local market, aside from that which has been contracted to the Garfield plant, to warrant making the improvements.

Since the introduction of slime treatment for low-grade gold-bearing ores of the Mercur district, there are excellent prospects for a number of the producers of that camp. The slime process was first unsuccessful on the Con. Mercur ores, but after a number of experiments George H. Dern made some alterations, which rendered it available. The same process has made a dividend-payer out of the Boston-Sunshine group, which is now controlled by the same people. A company has recently been formed to treat the ores of the West Dip section of the district, where they have an ore containing from \$3 to \$4 in gold. A number of the old dumps in the camp are to be re-worked and mining will be renewed in the old workings. All this is beginning to give the district a lively appearance. Boston capitalists have become interested in a few of these projects. A. W. Chesterton, a large shareholder in the Con. Mercur, is here from Boston, and says that they are making a close saving in the Boston-Sunshine group. They have paid \$10,500 in dividends within the past four months, and are preparing to increase the capacity of the slime plant. The mines and mills of the camp are now furnishing employment to over 600 people.

The sale of the Newhouse Mines & Smelter corporation properties, in Beaver county, was consummated Wednesday. Shareholders will meet in New York on Tuesday of this week and transfer their rights to the new company, which is known as the South Utah Mines Co. Within a week to ten days the mine and mill will be re-commissioned. The reduction plant has been overhauled, and the plant will be capable of treating 1000 tons of ore per day. Tests indicate an 80% extraction from an ore said to contain 3% copper.

Daniel C. Jackling has just returned from an inspection of the Ray Con. and Gila copper properties in Arizona. He says at the Ray the drills in the upper end of the company's territory demonstrate that the porphyry deposits are found at a greater depth from the surface than in the ground first explored. At the same time the ore zone is thicker. The tonnage to the acre in the new ground is large, the latest talley sheets showing 400,000 tons as compared with approximately 300,000 tons in the lower end of the estate. The grade of the ore is about 3.2%. The checking up of the ore extracted from the underground workings shows slightly more copper than was indicated by drill holes. The discrepancy is not great, but is gratifying. The main working shaft, which is to be 300 ft. deep, is down 150 ft., and the second level is being cut at this point. Drifts are being run on both levels, and there will be four levels in all. The shaft comprises two 7-ft. compartments. The hoisting capacity is to be 400 tons per hour. Steel for the 5000-ton concentrating plant has been

shipped and grading is under way. The grade for the standard railroad from Kelvin to Ray, a distance of six miles, is 80% complete, and 25% of the rail and tie work is finished. Four drills are now developing the ore deposits in the Gila, which adjoins the Ray. With this increased equipment the development is being carried on more rapidly, and the results are highly satisfactory.

The electric power plant and compressor at the Majestic properties, in Beaver county, have been commenced. Alex. Moffat, general manager, says that the real campaign of extraction, and development to greater depths, will be inaugurated at once. During the past year the company has opened silver-lead orebodies between the 300 and 500-ft. levels, and though the water-level has been reached, the shaft is being sunk 600 ft. A pump has been ordered and serious trouble with the water is not anticipated. In the meantime development of orebodies above the 500-ft. level, where the water was first encountered, is being continued and 4 to 8 ft. of ore for a distance from north to south of over 120 ft. has been found. In places the deposit is 15 ft. wide. The average grade of the ore shipped to date is 25% lead and 20 oz. silver. Some of the stopes show the higher grades while the drill cores from below the water-levels show as high as 60% lead and 80 oz. silver. The company is confident of success. After this mine is in operation it is planned to open the copper deposits in the Old Hickory and O. K. groups. A large tonnage of ore containing $2\frac{1}{2}\%$ copper and 20% excess iron occurs in these properties.

BUTTE, MONTANA.

Copper Combination.—Ryan Policies.—Copper Costs.—Green Copper and the Washoe Copper Company.

The Amalgamated and Cole-Ryan interests are said to be working to bring about a copper producers' combine to regulate production and price of copper, and to have the co-operation of J. P. Morgan and the Guggenheims. It is even stated that formal announcement of the fact is not far off. Rumors of negotiations have been current in Butte ever since John D. Ryan was elected president of the Amalgamated Copper Co. Mr. Ryan has always been an advocate of a better organization of producers, and his position gives him an opportunity to bring about such a combine. He has advocated a policy of expansion for the Amalgamated company, the acquisition of new mines and new ground, and also favors a policy of conservation, of great economy, and decreasing waste. If he is working for a copper combination it is to save the big deposits from depletion, as much as for any other reason. He believes that before many years a pound of copper in the earth will be worth several pounds of copper now in storage. He has constantly urged the necessity of cheaper production at Butte, and has accomplished a great deal. When he first became managing director of the Amalgamated it cost that company fully 12c. to produce and market a pound of copper. At some of the mines the cost was as much as 13c. Today the average is not in excess of 10c. per lb. The saving of mineral has also been considerably increased, although the loss still is about 20%. The loss is in tailing. This is re-worked by a leaching process but only part of the metal present is even then recovered. While the Amalgamated Copper company's metal costs about 10c. per lb. to produce and market, several of the companies run a little higher and one or two lower. For instance, the Parrot copper costs probably 11c. or more, Washoe and Trenton fully as much, Butte & Boston costs about 10c., and Anaconda produces about 93,000,000 lb. per year at a cost slightly under 10c. Boston & Montana, producing more than 100,000,000 lb., turns its copper out at 9c. per pound. The two Cole-Ryan companies, the North Butte and Butte Coalition, do better than any of the Amalgamated companies. Coalition copper costs about 9c. per lb., which includes the heavy expenditures for new work. North Butte produces at a cost under 9c. per lb., which also includes a large amount of new work charged to cost of production.

If the decision of the district court is sustained on appeal, the Washoe Copper Co. will be deprived of a very

valuable vein in the southern part of the Butte district. It was located as a quartz lode less than a year ago and called the Green Copper. It is situated within the boundaries of a tract of ground that has been owned by the Washoe company for many years, but its title is derived under a placer patent issued by the Government about 30 years ago. The locators of the Green Copper started to mine the ground last fall and were taking out some good ore when they were stopped by injunction. At the trial of the case they proved to the satisfaction of the court that the vein on which they located the Green Copper was known to exist and to be valuable for quartz mining many years before application was made for the placer patent. Under the law all known veins and lodes are excluded from the placer patent, and the court finds that a quartz vein was located and developed early in 1877, while application for the placer patent was not made until 1880. The decision gives the Green Copper people a width of 50 ft. along the vein for a distance of 1500 ft. At a depth of 100 to 200 ft. ore was mined a year ago that assayed 20 to 30% copper, and the vein is believed to continue to depth.

MEXICO.

Centennial Celebration.—Nazas Water.—Immigration Plans.—Railroad Earnings.—La Blanca Vein.—Zimapan Development.

September of next year will witness the Centennial of Mexico's stroke for independence, and celebration will be general, the program as announced, covering 27 days. Science, war, music, and history will all be well represented; there will be a fine exposition of flora and fauna; inauguration ceremonies for a number of important institutions will be attended with interesting parades, bands, and functions of one kind and another; but the event of most interest to the foreign visitor will be the grand historical pageant on September 15, the day on which the independence bell was first rung, and on the same day the theatres and amusement resorts will all be free to the public. On September 16 the unveiling of the great new monument to 'The Independence' will take place, followed by a fine military parade of thousands of troops. There will be innumerable balls, concerts, official ceremonies, fireworks, aviation contests, and expositions. Preparations are already being made for the great influx of tourists and visitors.

The Minister of Fomento, Mr. Olegario Molina, has been making a tour in the north and has been paying special attention to the question of the settlement of the distribution of the water from the Nazas river. No decision will be made public until after the Minister reaches Mexico City, and the Commission's report has been made. It is expected, however, that the Government will expend at least \$6,000,000 in improvements in the interests of the Nazas planters. The *Guanajuato Gazette* has made an interesting compilation of dividend statistics, comparing important gold and silver mines of about the same standing in the United States and Mexico. The following amounts show dividends paid up to July 1, 1909:

UNITED STATES.

| | |
|-------------------------------------|--------------|
| Alaska Treadwell | \$10,000,000 |
| Portland, Colorado | 8,317,080 |
| Stratton's Independence, Colorado.. | 5,028,560 |
| Tonopah, Nevada | 4,250,000 |
| Tom Boy, Colorado..... | 2,045,400 |
| Goldfield Con., Nevada..... | 1,866,775 |

MEXICO.

| | |
|---------------------------------|--------------|
| Esperanza | \$10,207,500 |
| El Oro | 5,333,260 |
| Peñoles | 4,366,685 |
| Sta. Gertrúdis & Guadalupe..... | 3,960,000 |
| Dos Estrellas | 3,780,000 |
| San Rafael | 3,179,938 |

The Federal Government has commissioned Federico E. Godoy, who was until recently Mexico's Minister to Cuba, to go to the United States and make a study of the immigration laws for the Department of Foreign Relations. This is with a view to the reform of Mexico's immigration laws. The Mexican Government is considering the question of

stimulating immigration. It is the opinion of some prominent foreigners, that reforms in the immigration laws will be useless unless reforms in the land and agricultural laws are first made, which will tend to break up the immense holdings of idle land in the hands of a few Mexican families. A stringent cumulative land tax on holdings over a certain size, on the lines of the New Zealand laws would be one solution of the problem. An increase in the wealth of the middle class agricultural population would tend to stimulate the demand for increase in silver coinage and thus indirectly assist the mining industry.

The result of the National Railroad merger was given in a report for the fiscal year ending June 30, which is as follows:

| | |
|------------------------------------|-----------------|
| Gross earnings | \$48,805,522.26 |
| Operating expenses | 29,166,893.33 |
| | <hr/> |
| Revenue from investments held.. | 1,386,094.44 |
| | <hr/> |
| | \$21,024,723.37 |
| Taxes, rentals, and depreciation.. | 2,781,636.45 |
| | <hr/> |
| | \$18,243,086.92 |
| Fixed charges | 16,975,943.88 |
| | <hr/> |
| | \$ 1,267,143.04 |

This balance was distributed as follows:

| | |
|-----------------------------------|-----------------|
| 2% dividend on first preference.. | \$ 1,153,316.00 |
| 5% for reserve fund..... | 63,357.15 |
| Carried forward | 50,469.89 |
| | <hr/> |
| | \$ 1,267,143.04 |

Nearly 3000 tons of machinery is on the way for the big hydro-electric power-plant on the Santiago river in Jalisco, the machinery being supplied by Seimens & Halske, of Berlin.

It may be of interest to know that the La Blanca mine,



General View of Pachuca.

at Pachuca, is on the same general belt as the Santa Gertrúdis. It is, in fact, an extension of the same vein, only one claim lying between the two properties belonging to the Real del Monte Co. It, therefore, seems that the report given out, that the La Blanca deal fell through, because the vein 'dipped' under the Santa Gertrúdis, was misleading, as this would appear to be impossible. Local gossip has it that the price asked was £500,000, with time payments, but that the brokers' commissions and promotion expenses brought the price up to a very large sum, and that there was not sufficient cash capital to pull the deal through. Added to this there was war in the promoters' camp over the division of the spoils.

The standard gauge railroad under construction from Pachuca to Zimapán Hidalgo, is well advanced, and as soon as the tunnel is completed, the line will be pushed to completion as fast as possible. The road will be about 100 kilometres long, and will cost between three and four mil-

lion dollars. At present only about 20 miles has been built, and the principal delay is the driving of the tunnel near Actopán, which will be about 500 metres long. At present the nearest railroad is at Sayula on the National lines, entailing a haul of about 46 miles. R. Honey is the principal backer of the enterprise, and the line is known as the 'Honey line'. Sydney Ludlow, the general manager for the Hidalgo Copper Co., at Zimapán, State of Hidalgo, says that development has been steadily pushed for the past four years on the copper lodes in their Concordia and Purissima properties, and that they have enough paying ore now blocked to justify the construction of a 200-ton smelter. Financial arrangements are being made with that in view. They will also install compressors, drills, hoists, aerial tramways, and the like. About 400 men are at work at the mines. Other mining companies that are of importance, are the Lake Zimapán Mining & Smelting Co., managed by R. F. Wrigley, and the La Cruz Mining Co., of which Miguél Taboada is president.

LONDON.

El Oro Mining & Railway Co.—Dharwar Reefs.—Tyee Copper.

The report of the El Oro Mining & Railway Co. for the year ended June 30 shows that 285,181 tons yielded \$2,442,374, of which \$2,149,091 was in gold and \$293,283 in silver, the total extraction per ton being \$8.56. The recovery was 91½% of the gold and 77% of the silver. The working costs in Mexico were \$5.42 per ton, which is a slight increase over previous years, due to the greater amount of work at depth and additional pumping requirements. With regard to the extraction, the directors are intending to still further extend the tube-mill outfit. The ore is to be crushed coarser and four more tube-mills are to be erected. It is estimated that with this new plant it will be possible to treat as much in the No. 2 mill as is treated in both mills at the present time, so that it will be possible to suspend operations at No. 1 mill, and in that way effect a considerable economy. It is reported that the recovery of the precious metals from the heavy sulphides in the lower levels is as complete as that from the oxidized ores. The ore reserves on June 30 were 383,269 tons, averaging \$9.10 gold per ton, a slight decrease in the tonnage as compared with last year. It has been difficult to continue development at depth owing to imperfect ventilation. The new shaft was down to 460 ft. on June 30, and should reach the 1000-ft. level in a little over a year. When this is completed the ventilation will be improved, and the development of the lower levels will proceed more satisfactorily. The English equivalent of the production was £498,244, and the mining expenditure, including depreciation, was £315,447. There was a profit of £11,000 on the railway, and of £21,361 on the sale of shares and dividends received. Dividends amounting to £172,125 were paid, being at the rate of 15% on the paid-up capital. The total distribution to date has been £1,181,187, which is just a trifle over the nominal capital of the company, £1,147,500. In addition £362,027 has been provided out of revenue for capital purposes.

The Dharwar Reefs mine in the Bombay presidency of India, controlled by John Taylor & Sons, has not turned out to be as good a property as was hoped. The company was formed in 1904, and, as developments were not successful, it was found necessary in April of last year to provide further working capital. The report for the fourteen months ended June 30 offers little encouragement. The results are distinctly disappointing, and in fact it has not been possible to supply sufficient ore to keep the mill going at capacity. During the 14 months, 21,574 tons was crushed, yielding on the plates 7477 oz. of bullion valued at £28,000. This was an extraction of 7 dwt., and the assay of the tailing was 3½ dwt. Great trouble has been met in dealing with the tailing, and it is only this month that the method of cyaniding has been settled on and treatment started. At first the extraction was hindered by re-precipitation of the dissolved gold by some electrolytic reaction, and experimental work was conducted for a long while for the purpose of determining some method of effecting the ex-

traction. It would be interesting to know what the difficulty was, but no details are published.

The Tyee Copper Co., Vancouver island, is passing through anxious times. Since the mines became exhausted efforts have been made to acquire other properties. So far none have been acquired, though substantial sums have been spent on options and examinations. There are now one or two being tried, but no definite decision has yet been made as to their suitability. In the meantime custom work is being sought for the plant at Ladysmith. An additional furnace has been erected, and the total capacity is now 12,000 tons of ore per month. During the year ended April 30 last the original smelter was only occupied for 7 months owing to scarcity of supplies, and the struggle for ores in competition with other firms is severe. The directors are not, nowadays, issuing such a complete balance sheet as they did when the company was devoted to mining, for the reason that it is not advisable to disclose the details of custom business. The loss on the year's operations, after making full allowance for depreciation, amounted to £22,000. The control is in strong hands and the chief shareholders belong to the Siemens circle. There is a large reserve fund, and still further capital would be available were there any encouragement for its profitable investment.

One of the most promising mining properties in Australia is the Great Fitzroy mine, 16 miles north of Rockhampton, Queensland. This was taken over by Bewick, Moreing & Co. two years ago, and has been most energetically developed. A year ago it was found desirable to increase the working capital, so the company was reconstructed with a nominal capital of £500,000. Of this, 375,000 shares credited with 18s. paid were given in exchange for the old shares, and the balance of 2s. paid in cash, yielded £37,500. Of the remaining 125,000 shares, 25,000 have since been allotted and the money paid. A year ago the ore reserves amounted to 334,000 tons, and on June 30 of this year they had been increased to 981,000 tons assaying 3¼% copper, 2.66 dwt. gold, and about 1 oz. of silver per ton. It is intended to develop for at least another year and fully investigate the extent of the orebody at the 400-ft. level. In the meantime the smelter is being kept at work chiefly on ore won in development. During the year ended June 30, 34,261 tons of ore was treated, producing matte containing 980 tons copper, 5990 oz. gold, and 32,499 oz. silver. A new concentrator and smelter are being erected and before long 18,000 tons of ore will be treated every month.

DENVER, COLORADO.

Conditions at Leadville.—Clear Creek Projects.—San Juan Output.—Cripple Creek News.—Wyoming Items.

Leadville is coming into prominence again. The panic of 1907 almost completely paralyzed this district. The metal market has recently been more favorable to the Leadville mines, especially those producing zinc. An increase of over 50% in the monthly tonnage for zinc ores took place in September. The recent strike of gold ore on the Highland Mary has stimulated work on the surrounding properties, such as the Grand Prize, the Curran, and the old Chemung. The South Evans section of the district is very active. Many of the lessees already operating here intend to continue throughout the winter.

Several changes in the ownership and control of various properties in the Clear Creek district have taken place lately. At Central City there is to be considerable development on the Little Pittsburg, by F. Crosby and associates of Kansas City, who purchased the lease on this property from Harvey Carl and Richard Broderick. The Russell and West Pewabic claims in the same district have been sold to Antoinette Burchell, of Sidney, Nova Scotia. The new owner has ordered the necessary machinery for shaft-sinking which will be commenced as soon as possible. A sheriff's deed has been recorded at Central City conveying the property of the Jefferson-Calhoun Mining Co. in the Russell district to F. A. Williams, a trustee for the company. A complete re-organization is planned. The New-house tunnel has entered some hard rock during the

past week. The breast of the tunnel is now on the far side of Nevada gulch. The management expects to reach the Gunnell vein in about six months, but, if the present grade of rock should continue, it will be considerably longer. The stockholders of the Georgetown Tunnel Co. have increased the capital stock from \$1,000,000 to \$5,000,000. One-half of the stock will be common and one-half preferred. The company intends to push work. The tunnel starts at the foot of Columbia mountain and will go completely through this and under the rich mines on Democrat mountain.

The Wilcox adit at Argentine is expected to intersect the Wheeling vein this week. It is being driven to reach the ninth level of the Stevens mine.

The Denver & Rio Grande railroad in the San Juan district was open for the shipment of ore and supplies for only six days in September. With this limited shipping period, the production was 825 tons of concentrate and 575 tons of crude ore. Should the railroad be kept in operation for the whole month of October a record output may be expected. An important strike of high-grade silver ore was made in the San Antonio mine, on Red mountain, during the first part of the month. The ore is rich in stromerite, and resembles the ore discovered on the Yankee Girl several years ago.

The State Mine Inspector's report for the Cripple Creek district shows only 13 fatalities during the past year. Most



Mineral Belts of Colorado.

of the accidents have been caused by drilling into missed holes. Falls of ground such as killed a shoveler in the Roosevelt tunnel recently have been rare. The drainage tunnel is handling more water now, although there has been no change in the character of the rock. The option on 72,500 shares of the El Paso stock held by Allen L. Burris has been taken up. This is the largest single transaction on the Colorado Springs exchange for some time.

The little mining town of Dillon, Wyoming, has been destroyed by fire. This town is near the mine terminus of the famous 16-mile aerial tramway which connects the Ferris-Haggerty mine with the smelter of the United Mines & Railway Co. at Encampment. The New Rambler mine, near Holmes, Wyoming, has been shipping steadily for two months to the Argo smelter at Denver. Since this smelter has served notice that it will discontinue about December 1, the ore will hereafter be shipped to the Omaha plant of the A. S. & R. company. In view of the longer haul, the Union Pacific has reduced its freight rate to Denver 50c. per ton, and the Laramie Plains line has reduced its rate 10c. to help out the producer. The ore is covellite containing an important amount of platinum and some gold.

Discussion.

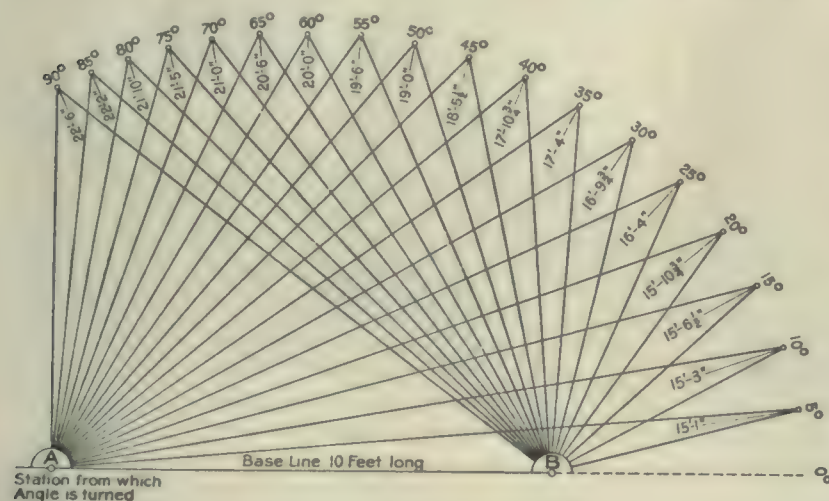
Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Deflecting Angles with a Thirty-Foot Tape.

The Editor:

Sir—The method described by Lee Fraser in your issue of October 2 calls to mind a similar method and table calculated by Frank G. Wolfe, engineer of the Scranton Coal Co., and published in *Mines and Minerals* for June 1908. For your information I enclose a copy of the diagram and description of the method.

"A mine foreman or superintendent frequently wishes to lay off an angle in the mines when he has not a compass handy, or it may be that on account of iron nearby a compass cannot be depended upon. With an ordinary tape, such as nearly every foreman carries, an angle can be laid off closely enough for all practical purposes as follows: Example, from the point A on the line AB to turn an angle 50° to the



left. To do this, fasten the 0 end of the tape at A, then stretch the tape to B, a distance of 10 ft., and fasten the 10-ft. mark at B, next find the 30-ft. mark on the tape, carry and fasten it at A. This will leave 20 ft. of slack tape between A and B. For an angle of 50°, find the 19-ft. mark on the tape, and draw the tape tight from both A and B. The tape-line from A to the 19-ft. mark will make an angle of 50° at A from the line AB. For an angle to the right, use the same measurement on the right of the base-line."

RUFUS J. FOSTER.

Scranton, Pennsylvania, October 14.

[The method Mr. Foster mentions is so simple that we take pleasure in reproducing the diagram and explanation, with our thanks for his courtesy.—EDITOR.]

Excess Ground in Mining Claims.

The Editor:

Sir—Referring to your article, and to that of Mark R. Averill in your issue of October 9, I can not see why you both seem to avoid the question of an excess in length. This is rather the more important of the two. I regard Mr. Averill as wrong in saying

that a locator can elect which end to cut off. The location notice or 'stake' is the inception of every mining title; a man puts up his 'notice' thus, "I claim 500 ft. north and 1000 ft. south on this vein, etc." When it is discovered that he has set his end stakes 600 ft. north and 1000 ft. south, I think that he can be compelled to drop the excess from the north end, provided, of course, that there is an intervening claim for that excess before he makes an amended location. If there be no intervening private claim, it is beyond question that an amendment or re-location can be made at any time, in any direction, and to any extent within the statutory limits, prior to a patent survey. If an adverse be made to a patent application I believe that my rule should hold good, and after a patent has issued I do not see how the question can reasonably be decided otherwise. I believe that there has been some court decision declining to require an owner to cut off anything from a patented claim found to be more than 1500 ft. in length; but in the case cited the excess was small (3 or 4 ft.). There would evidently be a limit to the excess which could thus be retained: but the limit of allowance would have to be decided by a court after hearing the conditions in any case.

VICTOR G. HILLS.

Denver, Colorado, October 12.

Factors in Successful Gold Mining.

The Editor:

Sir—In your issue of May 1, F. J. H. Merrill says that "Mining properly handled is as safe as any other commercial industry." This statement is often seen, but its correct interpretation demands some study of the factors in successful mining as compared with other enterprises. The word mining itself, is vague, because there is a fundamental difference between gold and all other mining. Gold is

a metal that has a fixed mint value and a constant demand, though not a fixed value as measured in commodities; all other mining is governed by the demand for some metal or substance, having no fixed value nor any value in other commodities without an intermediate relation to gold as money.

All classes of mining except gold mining may be supposed to pay more than the money put into the ground. Since the advent of free labor, however, the best authorities agree that the cost of mining gold has been more than the mint value of the gold produced. The cost is variously estimated at two or three times the return, but exact figures are unattainable. My own observations in Europe, South Africa, and North America incline me to adopt the first named ratio. Wherever a successful mine occurs many unproductive ones are also present. This is not so true of coal, slate, or lead mines, or of cement works.

This is not because the profits are less than from gold mining nor because capital is required for development and machinery for operation, because this applies as well to gold mining. The reason lies

in the nature of the deposits of gold ores. In proportion to the cost of production, gold offers rewards much greater than other metals or substances. The demand for gold is constant and the value per ounce not subject to fluctuation.

The essential factors of successful mining are, (1) ore, (2) demand or market, (3) capital, (4) management. The demand for a metal or substance depends to a great extent upon gold, money, and credits. Therefore, in considering the essentials of gold mining, other forms are covered. A gold mine to be a successful enterprise must have ore that will pay, capital to develop the mine and install machinery, and efficient management. Of the failures of gold mines that have come under my personal notice, and by mines I mean those that have gone beyond the prospect stage and have produced more or less gold, I find them due to the lack of three essentials; ore, capital, and management in about equal proportions. I find failures due to lack of sufficient funds to put in proper machinery to be about equal to those due to lack of ore.

Ore is an indefinite term and can only be considered in relation to capital and management. What is waste with a few thousand dollars, may be ore with a larger sum. Ore, then, is rock which if mined and treated will, ultimately, pay back all the money invested with interest at a rate commensurate with the risk; provided the necessary capital for economical working has been available and the management competent. The rate proper of interest is indeterminate because it depends upon the individual idea of money making, but, comparing the rate with that which can be secured on first-class securities 20% would be the minimum.

If money be invested in railroad or municipal bonds these at maturity will be worth near the purchase price, if it be invested in a mine the land and plant are valueless when the ore is mined out, so that mining differs from other fields for investment in that there is no final value to compensate for the capital invested. All remuneration must come from the sale of the metal or substance mined. In comparison with gold mining, investments in bonds, and other related securities may be considered.

How long may the life of a mine safely be estimated? On this point depends the rate of interest necessary for compensation. Authorities differ in their estimates, but seven years is often considered a fair average; that is to say, the average life of a producing gold mine is about seven years. If I invest a thousand dollars in railroad securities which bear 5% interest and I invest the dividends each year at the same rate, at the end of seven years I have a thousand dollars worth of bonds and \$405 in interest, or \$1405. If I invest the same amount in a gold mine and invest my dividends each year at the same rate, I must have each year a dividend of about \$172; or 17% on my investment. If in both cases I spend my dividends each year, the rate must be 19%. It is now seen why intelligent investors in mining stocks demand from 20 to 25%. The difference between the 17 and the 25% measures the risk.

The value of a metal mined depends upon the demand for the metal. Demand is a psychological

phenomena. It depends upon the money and credits in circulation, which again depend upon business confidence. Lack of confidence or panic means hoarding of money and lack of credit, less money going into mining, and the appreciation of gold as measured in commodities. In other words gold is at a premium. Men released from other classes of mining rush to gold prospecting, mines are discovered, and when confidence is again restored the necessary capital is available for mining the precious metal.

We need no statistics to prove this. The past year has demonstrated that the prices of commodities are influenced by the amount of money and credits in circulation and the velocity of their circulation. The relation that this has to mining is evident. If the success of a mining enterprise depend upon capital, any condition that affects capital bears upon the success of mining.

If the gold produced each year entered our currency system and at the same velocity as at present, say, once a week, there would be a continual rise of prices of commodities and labor, or a depreciation of gold which would make gold mining generally unprofitable. Fortunately not more than a fourth of the gold produced goes into circulation. This no more than keeps pace with the increase of population. So while the velocity with which money and credits circulate is increasing, due to better means of transportation and communication, the rise in prices is slow and does not keep pace with the improvements in the arts of mining and metallurgy.

The amount of capital necessary to bring a mining venture to fruition is one of the most important things for an engineer to estimate, one that requires the most careful consideration, and one that is most often not considered at all. The number of mines that pay from the grass roots without any financiering are extremely limited. Each mine is a problem of itself, depending upon size of vein, extent of development, and future prospects. While it is mathematically true that the sooner a mine is exhausted the greater the profits, it would be just as unwise to put a 100-stamp mill on a 1-ft. vein of \$20 ore as to put a 5-stamp mill on a 100-ft. vein of \$3 ore. To determine the correct proportion is the business of the mining engineer, not that of the financier. It is most imprudent, in fact suicidal, to put the uneducated miner or the business men unaccustomed to mining and metallurgical operations, in charge of mining enterprises, particularly of gold mines. The mines that such men could work to advantage have long since been worked out, in our own country at least. The engineer or mine superintendent must now handle ores that under the best conditions return but a small profit per ton. To him shareholders must look for remuneration.

If the factors for successful mining are sufficient ore, adequate capital, and efficient management, and the relative importance of these be about equal, any mine-promoter or mine-financier who leaves out of consideration any one of the three is discounting the success of his enterprise just 33 per cent.

ALGERNON DEL MAR.

Granite, Oregon, September 27.

A WORLD'S RECORD IN TUNNEL DRIVING.

Written for the MINING AND SCIENTIFIC PRESS
By BURT A. HEINLY.

The world's record for tunnel boring is claimed by the engineers of the Los Angeles aqueduct with a run of 1061.6 ft. which was made during the 31 days of August at tunnel 17 M. This surpasses the run of 1013 ft. made in July on the Loetschberg tunnel in Switzerland, where all previous international records in tunnel boring had been broken. At Loetschberg the material is a limestone and the boring was accomplished with four air-drills. The formation in tun-



Red Rock Cliffs. Illustrating the Character of the Rock in Which the Tunnel was Driven.

nel 17 M. of the aqueduct is a sandstone of excellent quality for rapid work. The aqueduct record is remarkable not alone for the distance made in lineal feet but also for the low cost, which was \$6.48 per foot. The run is the result of an intense rivalry existing among the many different crews at work on the 240 miles of the great municipal water-works project, now in the third year of its progress, and was attended with some unusual conditions.

The bore has an inside dimension of 10½ ft. in height by 8½ ft. in width. The top portion is arched with a radius of 4 ft. 3 in. and the bottom is an invert with a radius of 9 ft. 6½ in. The sides are vertical. The tunnel is to be lined with an average thickness of 8 in. of concrete, but where timbering is required the concrete will be 12 in. thick.

When completed the tunnel will have a total length of 10,596 ft. under the Red Rock summit. So cheap has the excavation of tunnels along the aqueduct proved, that it has been found that a large saving can be made in distance and money by replacing some of the conduit planned by underground excavation. Tunnel 17 M. is the first and longest tunnel which is being excavated in section No. 1 of the Jawbone section under the new survey. It lies 28 miles north of Mojave on the edge of the Mojave desert in

what are known as the Red Rock bad lands. The heat here is surpassed only by that of the famous Death Valley, 100 miles to the northeast. During the month in which the record was made the daily temperature ranged from 100 to 117°, and was bearable only because of the great dryness of the atmosphere. The 'graveyard shift', which worked from 11 p. m. to 7 a. m., was required to obtain what rest it could under this condition, to which was added the intense sunlight of the desert-day and the pest of flies.

All the work was done by hand. The holes, which approximated 3 to 12 ft. in depth, were driven with hand-augers, and the muck was transported to the tunnel-mouth in muck cars drawn by mules. The 'lower-heading' plan was adopted in the work. Two miners were placed at the face and these were followed by two on a movable platform under which the muck car was run. The work of the latter two miners was to trim and cave to the required dimensions. Five men were employed handling muck and laying rails. Thus each shift was composed of four miners, five muckers, and a shift-boss. The shifts worked eight hours, and were under the direction of



Portal of Tunnel.

the general foreman and a tunnel superintendent. For each lineal foot of excavation 4.2 lb. of 40% 1⅛-in. ammonia powder and 2.2 lb. of black powder were used, making a total of 6.4 lb. to the foot. Each round was composed of eight shots arranged, three in a row across the top, three in the breast, and two as bottom holes. No machinery was used in the tunnel. In place of the usual blowing apparatus, ventilation was secured by driving holes through the roof of the tunnel to the surface, a distance of about 75 ft. No timbering was required.

At midnight of July 31 the face of the tunnel was in 964 ft. During the latter part of July the men petitioned William Mulholland to increase the force to three shifts. At the time they had a larger footage to their credit than had been made elsewhere on

the aqueduct, and they were confident that full-handed they would be able to win the world's record. The request was granted and the phenomenal pace was started as the new month began. The work was carried on without cessation until August 29, when a cloudburst in the mountains caused a partial flooding of the tunnel. A loss of 16 hours resulted before work could be again resumed. The total time employed was 728 hours. Thomas Flanigan, superintendent, and Benjamin Pruitt, foreman, were in charge, with A. C. Hansen as construction engineer.

The total cost of the month's work, including all field expenses, was \$6683.28 divided as follows:

| | |
|---------------------------|------------|
| Labor | \$5,429.13 |
| Live Stock | 259.20 |
| Materials | 995.80 |
| Freight and handling..... | 199.15 |
| Total | \$6,683.28 |

This is equivalent to \$6.39 per lineal foot, to which has been added an engineering expense of 9c. per foot.

The best previous American record, so far as is known, is that made on the Gunnison Reclamation tunnel in March 1906 with a run of 810 ft. In this instance the tunnel was driven under the unusual condition of a shift working at two headings from a shaft, the miners and muckers alternating at each of the two faces. The advancement of the tunnel face was followed with the keenest interest by aqueduct employees, and within a half hour after measurements had been made, each day the results were known and posted in every camp along the 240 miles of aqueduct.

The speed attained was to some extent due to the bonus system under which the men were employed. The rate of bonus depends upon the hardness of the rock formation. In this instance the average rate of progress for an eight-hour shift was established at 4 ft., with a bonus of 25c. for each foot in excess of this rate. Each shift actually drove 11.27 ft. Each man, therefore, employed underground received, in addition to his month's salary, a bonus of approximately \$55. The total bonus paid by the city was \$1508.86.

This makes the third tunnel record to be broken on the aqueduct within the year. In October 1908 the forces employed on the south end of the Elizabeth tunnel 26,964 ft. long, established a new, United States, 31-day, three-shift, record for boring in hard rock by a run of 466 ft. This eclipsed the Gunnison record by 17 ft. Again, in March of this year this same organization eclipsed its own record at the same tunnel portal by a run of 476 feet.

More than one-eighth of the Los Angeles aqueduct project comprises tunnel-work. The distance exceeds 33 miles, the tunnels ranging from a few hundred feet to several of more than 10,000 ft., and one, the Elizabeth tunnel through the Coast Range, having a length of 26,860 ft. More than half of the excavation of the entire 33 miles has been accomplished within the past 12 months. The most modern tools have been supplied, but the rapid progress can be traced largely to the *esprit de corps* of the engineering organization and the high rivalry to excel that exists among the different camps.

PRESENT CONDITIONS AT THE GARFIELD SMELTING WORKS.

Written for the MINING AND SCIENTIFIC PRESS
By L. S. AUSTIN.

The Garfield copper smelter is a plant belonging to the American Smelters Securities Co., a subsidiary of the American Smelting & Refining Co. I had visited it in 1905 and again in 1907. On the first occasion it was about ready for operation; on the second, defects inherent to a new plant, were still evident and to be remedied. At a recent visit of the American Institute of Mining Engineers I was gratified to find those defects well overcome, the plant expanded, and basic converting in operation. Too much praise cannot be given to those in close touch with the operating of the works who have contributed to these successful results.

One initial defect was due to an elaborate flue-system which had numerous turns, injuring the draft so that it was difficult to melt the charges in the reverberatory furnaces. To overcome this the converter-flume was led to independent stacks, so that the regular flue-system did not have to take care of it. The flue-system itself was simplified, tightened and shortened, and the catenary flues were strengthened. In consequence the draft was so improved that the reverberatory furnaces were able to attain their full efficiency, a tonnage of 275 tons being handled in 24 hours. These furnaces are operated under forced draft. The fire-box is divided into two parts by a mid-wall so that one-half the grates can be cleaned while the other half continues under pressure.

Another difficulty arose from the defective operation of the conveying system which delivers ore to the sampling mills and to the storage bins. In consequence there were frequent stoppages, and men were set to clean out feed-chutes and to repair defects and break-downs. The Robins Conveying Belt Co. was able to suggest such changes that today this elaborate conveying system is operating smoothly. Its arrangement and operation are described in *Mines and Minerals*, Vol. XIII, p. 305, and in the 'Mineral Industry', Vol. XVII, p. 240, where is to be found an extended description of the Garfield plant.

A third defect noticeable two years ago was the method of charging the blast-furnaces, in which the ore dropped at least 12 ft. from a charging trough set at the charge-floor level. The present arrangement consists in having at each side of the furnace an inclined bottom hopper, as long as the furnace itself, which receives the charge on the side of the track away from the furnace, so that the charge slides instead of falling into the furnace. Where it fell into the furnace it tended to unduly pack the charge and to increase the quantity of flue-dust. It is to be noted that all ore going to the blast-furnaces has been screened to free it from material finer than $\frac{3}{8}$ -in. mesh. This not only lessens the amount of flue-dust, but contributes to the faster running of the furnace, so that a furnace 4 by 20 ft. at the tuyeres puts through 550 to 600 tons per day, a performance

per square foot of hearth area that exceeds the duty at other similar plants in the United States.

Formerly all the ore went through the sampling system. This has been modified by taking out, after coarse crushing at the delivery point from the receiving bins, one-tenth by a large Vezin sampling machine, the rejected portions then going to storage. The converter slag, amounting to 500 to 600 tons per day, is molded in a Kelly slag-casting machine ('Mineral Industry', Vol. XVII, p. 275), and which has proved to be successful partly because of its simplicity, the slag on cooling in the molds being dumped by hand. All this slag is sent back to the blast-furnaces.

Perhaps the most important, bold, and radical change made has been the putting in of a basic-lined converter. This makes probable a step in advance in metallurgy formerly thought impossible. Hickson had experimented with a water-jacketed converter years ago, and had stated that such a device, since it would supply no silica to the charge, could not be used. Later it had been attempted to add the necessary silica by blowing it in at the tuyeres, but this had not been a success. Of recent years silicious ore added to the charge in the converting vessel has assisted in fluxing the iron oxide as fast as it forms, and has thus contributed to saving the lining. Experimental work on the Baggaley converter at Butte, where silica was freely added in the converter, has demonstrated that such external additions may be sufficient. It remained, therefore, to be demonstrated by Brown and Smith at Baltimore, particularly by the latter, that a basic lining could be used, in which the demand of the charge for silica could be met by the addition of a calculated amount of silicious ore. The converting process was thus brought to the point of scientific precision, and no longer involved treatment of a charge of variable composition with dependence on the eye for determination of results.

While the principle of a basic-lined converter is not patentable, application of it, and of details of construction are, and experience is showing where to make them. The converter vessel as used at Garfield, is of the barrel type with a shell 22 to 24 ft. long by 10 ft. diam. In general appearance it is like a Brückner roasting cylinder. This is lined with magnesia brick 18 in. thick at the bottom or lower part, when in the blowing position, and 9 in. above. As much as 2000 tons of copper has been produced with a single lining. The spout, or outlet, for the escaping gases, situated near one end of the shell, shows them to be going off quietly and with the emission of only few solid particles. In fact this gradual escape would seem to indicate slow working. Besides the regular opening is a spout and tap-hole plugged with clay, but which can be opened at the time of pouring the slag. The tuyeres, set 7-in. centres, extend the whole length of the shell. This shell is parted by a longitudinal joint to allow for expansion, with tie-rods which can be let out as the converter becomes heated. Matte of varying grade, say of 30 to 40%, is poured into the converter, and the forming slag, as it accumulates, is poured off from time to time, additions of matte being also made as required. A charge of 40 tons may be poured at a time. The blister-

copper is transferred to a reverberatory furnace where it is poled to enable it to be cast smooth and molded in a Walker casting machine into anodes. Another method of casting, now being tried, consists in using a tilting furnace resembling a barrel converter, large enough to take 50 tons or more of blister-copper. This again is cast in a Walker casting machine. It should be remarked that no particulars have been given of the actual operation of the converter or of the difficulties which have been met.

The Huntington-Heberlein, or pot-roasting, plant has been given up, as it has added to the cost of treatment. In its place the ore is now screened, the fine going to the reverberatories. This roasting operation may be reckoned to cost from \$1 to \$1.50 per ton.

William H. Howard, the superintendent of this plant, is taking much interest in the building and organization of a village of some 80 cabins, and of a large boarding house situated just below the smelting works, and between it and the lake. This is intended for lodging the foreign workmen of the plant, Austrian, Greek, and Japanese. In the village an agent of the smelting company acts the part of mayor, and there is a deputy sheriff for keeping order. Each cabin holds six men, the rent being \$6 per month, or \$1 per man. Each cabin is provided with a stove, and with bunks, and they are much in demand. The boarding house is intended for the Japanese, and consists of two wings, having two-story iron cots, and a central dining room. The house is rented to a responsible man at \$125 per month. This man boards the inmates. Shower baths and wash-basins are liberally supplied for the use of these people, who are a particular and cleanly race. The Austrians are of the three races the largest and strongest physically, and can be depended on for the heaviest work about the furnaces. The Greeks are smaller, weaker, slower, and need close supervision. The Japanese, though a small race, are enduring, intelligent, and anxious to learn. The repair gang at this plant was, for example, made up largely of them.

The Chilean Government has appointed a commission under the direction of the Ministro de Industria y Obras Públicas, at Santiago, to study the question of electrifying the portion of the State railways between Santiago and Valparaiso, a distance of 115 miles. It is proposed to complete the double tracking of this portion of the State railways, for which about one-half of the grading has been completed. It is understood that an offer has been made to put in the installation, including the hydro-electric plant, at a price that would make a handsome saving for the Government in operating expenses over the present steam motive power employed, since coal is expensive. It is only a beginning that will eventually cover the whole Government railway system.

Powdered aluminum is used to an increasing extent in the manufacture of metallic paints and varnishes, its property of not tarnishing making it particularly suitable for this purpose. The paint is valuable in protecting iron, and in rendering wood-work partly fireproof when applied in thick coats.

COPPER IN SOUTHWESTERN WISCONSIN.

Written for the MINING AND SCIENTIFIC PRESS
By G. H. COX.

Since the early days of mining in the upper Mississippi Valley district, when copper was found in paying quantities in the vicinity of Mineral Point, Wisconsin, rumors of the discovery of copper have been so frequent that mining men have become tired of investigating. While copper to the value of more than a quarter of a million dollars has been shipped from the district, there has been no important output for many years, and most reputed discoveries have proved disappointing. Consequently the discovery this summer of a workable deposit in this district is of exceptional interest. I recently examined a copper prospect, situated in section 36, T. 2 N., R. 3 E., about five miles in a direct line from Gratiot and eight miles from Shullsburg, which shows by the appearance of the dump that an unusual deposit of copper has



Copper Prospect. Gratiot, Wisconsin.

been found. A number of shallow test pits have been sunk to permanent water level, a depth of 18 to 28 ft., and the ore extracted therefrom was to be seen upon the dumps. The ore consists mainly of chalcopyrite, chalcocite, malachite, cuprite, azurite, bornite, and some small pieces of native copper. Apparently the original mineral was chalcopyrite. The alteration of this has formed the secondary minerals and at the same time increased the percentage of copper. Assays yielding 40% copper are claimed for the best ore, and at the present time there is a car of ore on the dump which will probably average between 20 and 30%. After sinking through about three feet of soil, loose pieces of ore were found scattered over the surface of the limestone about the tops of a series of 'ten o'clock' crevices. Shafts had been sunk upon two of these crevices, about ten feet apart, both in good ore. The width of the crevices has not been definitely determined because of the decomposed condition of the rock at this place. One is said to be four feet across but it is clear that a part of this is due to solution later than the deposition of the ore, as the latter is found in loose chunks in a soft, sandy, dolomitic mass. However, the original crevice must have been at least two feet wide as one piece of ore weighing 600 lb., and a number of others weighing 200 to 300, were extracted and are now to be seen at the prospect. Nothing is known about the distance the orebody extends along the crevices be-

yond perhaps 150 ft. It is claimed that pieces of copper ore have been found at intervals along the strike of these crevices for a distance of three miles northwest and one-half mile southeast. Vertically the ore has been opened to a depth of 28 ft. A 16-ft. rod can be pushed down its full length into the crevice below this level, showing that apparently the crevice extends for at least this distance below. It was not possible in the time available to determine the exact stratigraphic position of the deposit, but seemingly it is in the lower portion of the lower non-flinty beds of the Galena dolomite (Ordovician). It seems probable that the oil-rock occurs within 10 ft. of the bottom of these holes, and if so, the open condition of the crevice indicates that the ore extends down into the Plattville limestone.

The occurrence of pyrolusite, and wad, in pieces 6 to 8 in. thick, is both extraordinary and peculiar, though of no known economic significance. The statement of the miners that steel tools placed in the spring water, which issues from one of these crevices, are soon coated with a copper precipitate is important, if true. The flow is quite strong and a solution of such strength would be the best evidence available in favor of the occurrence of a large deposit of copper close at hand. The deposit is exceptional in both the occurrence of copper and manganese. It is isolated, there being no mines within a number of miles. It further complicates the matter of a satisfactory explanation of the origin and occurrence of the ores of the district.

MAGNETIC SEPARATION.

The first application of magnetic separation was in the concentration of certain iron ores, principally magnetite, in order to produce a product richer in iron, and also to eliminate certain minerals that contained elements injurious to the metallic iron. The next application was to other iron ores, such as limonite, hematite, and siderite, after they had been given a preliminary roasting to convert them into the magnetic oxide. The next step was in the separation of magnetic iron particles from certain copper, gold, and zinc ores, either before or after roasting. For many years this was the only application made of magnetic separation. It was found, however, upon experimenting with an electro-magnet with a higher intensity, that other minerals were subject to magnetic attraction, and that it was possible to separate minerals into more or less pure products by varying the intensity of the magnetic field. Thus, it has been possible to adapt this method of separation to ores containing iron or manganese which are only weakly magnetic. As is well known, steel bars may be magnetized, and they will retain more or less of this magnetism indefinitely, while bars of softer wrought or cast-iron may be magnetized by means of electric currents in surrounding coils of insulated copper wire. These iron bars do not become permanent magnets, but form electro-magnets as long as the current flows around them. They can be given a greater and more constant strength than can be given to the permanent steel magnets, and for this reason, in nearly all of the magnetic processes, electro-magnets are used instead of the field magnets.

MODERN PRACTICE OF ORE-SAMPLING.

By DAVID W. BRUNTON.

*From the old-fashioned 'grab-sample' to the modern timing device, which takes a machine-sample with mathematical precision, there is a wide gap which was only crossed by many years of toil and unremitting endeavor. Even today 'grab-sampling' is still practised, sometimes to afford the unscrupulous mine-promoter a basis for fairy tales with which to entrap the too gullible investor, and often by milling and smelting companies to determine the amount of moisture in custom ores. The latter practice is almost as reprehensible as the former, and it causes more trouble and ill-feeling between seller and buyer than all other factors put together. Samples for the determination of moisture should be taken with as great care as for the determination of metallic content, and in order to avoid the extra expense of a separate operation, moisture-samples should be taken from the sample-safe. As the sample reaches the sample-bin in a smaller stream and by a more circuitous route than the 'reject' travels in its path to the outgoing car, it loses more moisture on the way, and a constant should be added to compensate for this difference. Carefully conducted experiments have shown that the difference in loss of moisture between the two routes does not exceed 10% in summer and 7% in winter.

Shovel-sampling, another archaic method which is still used in some localities, consists in throwing out from the car or wagon every third, fifth, or tenth shovelful for a sample. As the portion of the pile from which the sample is taken is entirely at the discretion of the operator, the process would be more properly named fifth-shovel selection than fifth-shovel sampling.

Thirty years ago Cornish quartering was the almost universal method of sampling in use, and it is still employed to a considerable extent in cutting down machine-samples and in mine examinations where no machinery can be had. When properly carried on with skill, care, and common honesty, fairly good results may be obtained by quartering, but between the possibility of accidental mistakes and the opportunities which it affords for skillful and unscrupulous operators to manipulate the sample, it has fallen almost into disuse, and should have been completely abandoned long ago. The inherent defect of this system lies in the fact that piling a lot of ore in the form of a cone does not mix it, as the advocates of this system claim. Dropping shovelful after shovelful of ore on top of a cone, instead of building up a homogeneous pile, actually produces a very perceptible sorting action, whereby the fine builds up where it falls on the centre of the cone and the coarser particles roll outward and down the sides. The most uniform and best results are obtained by coning around a rod.

The most ingenious plan adopted by unprincipled operators for 'throwing' the sample, and one which is so difficult to detect that it can be carried on directly under the eyes of a skilled observer without

detection, is what is known as 'drawing the centre'. The cone is started on the floor, without any rod to determine the position of the centre. The operator in charge of the work, in dropping his shovelfuls of ore on the top of the cone, does it in such a manner as to draw the centre of the cone imperceptibly in a certain direction, so that by the time the entire sample is piled and ready for spreading, the apex of the cone is several inches, we will say, to the southwest of the original centre. The ore may now be spread as usual with shovels or with a board, and cut and marked into quadrants by steel blades in alignment with the four points of the compass. By rejecting the northwest and southeast quarters an excess ratio of the fine is eliminated, and since this is generally the richest ore, the metallic content of the two retained quadrants will be somewhat less than the average of the original pile. Suppose a 2000-lb. lot is to be reduced to 62.5 lb., it would mean that the 'quartering' (really halving) would have to be repeated five times, and if at each stage the sample taken represented 98% of the actual value of the cone, the final sample would only give 90.3% of the true value of the cone, as shown in the following tabulation:

| | Original lot. | 1st cut. | 2nd cut. | 3rd cut. | 4th cut. | 5th cut. |
|---------------------------|---------------|----------|----------|----------|----------|----------|
| Weight, pounds | 2000 | 1000 | 500 | 250 | 125 | 62.5 |
| Percentage of true value. | 100 | 98 | 96 | 94.1 | 92.2 | 90.3 |

The irregularities in the results obtained by Cornish sampling, together with the cost of operation and the amount of room required, soon brought about what is known as 'split-shovel' sampling, in which the ore is thrown from a broad shovel, handled by one operator, upon a narrow U-shaped shovel, held by another workman, usually directly over a car or wheelbarrow. This method, while it requires two men to do what normally appeared to be the work of one, was cheaper than Cornish quartering, but it proved no great improvement over the latter in point of accuracy, since carelessness in almost any direction interferes seriously with results.

The earliest attempts at mechanical sampling were made by subdividing a falling stream of ore; a process based on the supposition that an ore-stream could be mixed so as to be perfectly homogeneous. Both analysis and experience have shown that this ideal condition is impossible, and mechanical devices for taking a portion of the ore-stream all of the time have been almost entirely displaced by machines designed to take all of the ore-stream for a portion of the time. It is not practicable to produce a stream of ore which shall be continuous in value through every part of its length any more than it is possible to produce a stream of ore that is constant in value throughout its width; but by taking a small sample entirely across a falling stream at short intervals it is found that, while no single cut would give an exact representation of the composition of the entire lot, the average of thousands of these small samples is so nearly correct that results can be duplicated within very narrow margins, or, in other words, that individual errors are balanced. This was not the case with the devices used for taking a portion of the stream all the time, since the errors due to feed, inclination of spouts, or wear on the bottoms of

*Read before the Spokane meeting, September 1909, Amer. Inst. Min. Eng.

the spouts, are constant, and do not vary during the time the samples are being taken.

Almost coincidental with the discovery of the fact that accurate samples could be obtained by taking all of the stream for a portion of the time, came a considerable improvement in rock-crushing machinery, so that the modern engineer has a much better opportunity to construct a satisfactory plant than the builder had 20 or 30 years ago. Not only are the rock-breakers and rolls of today greatly improved in design, but the manufacturers have availed themselves of modern cheap steel to give all parts an excess of strength over any possible strain, while the use of alloy-steels for the wearing surfaces permits the machines to be kept in much better repair, and requires fewer stoppages for renewals. For sampling-work, crushers and rolls can now be had which are almost as well made as the ordinary steam engine, and so designed as to give complete accessibility for renewals and for cleaning.

Gyratory breakers of the Gates type have the advantage of delivering a uniform product, and in crushing ores that are hard and dry this type forms

newer devices, although the modern sample-grinder is much heavier, better built, and more easily cleaned than its predecessors.

The first mechanical samplers were imitations of Cornish quartering, the 'whistle-pipe' being the most common type. With ore finely crushed, fairly dry, well mixed, and entirely free from strings and rags, and with the dividers new and exactly centering the pipe, fairly good results could be obtained by this method; but as these conditions never existed in practice, and as the edges of the cutters wore rapidly, thereby moving the dividing line back from the centre, this form of sampling machine was soon discarded, and I believe has now fallen into absolute disuse.

Following the whistle-pipe sampler came the various forms of mechanical split-shovels; but as there was no place in a spout, no matter how wide or carefully built, where a single U-shaped spout could be placed to take a sample which would represent the entire width of the stream, this form also was soon discarded.

More recently this splitter has been revived by an

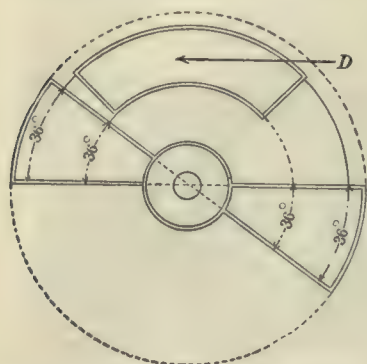


Fig. 1. Delivery Spout of Charles Snyder Sampler. Cutting Edges Radial.

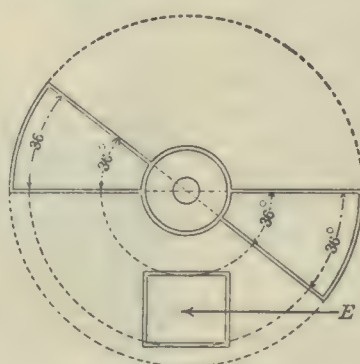


Fig. 2. Delivery Spout of Vezin Sampler. Cutting Edges Radial.

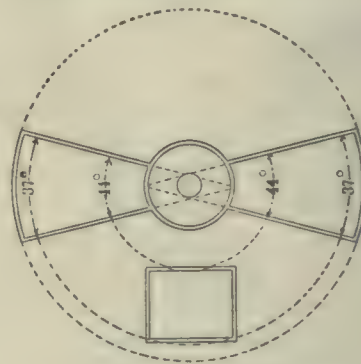


Fig. 3. Cutting Edges Not Radial.

by all odds the best initial crushing machine; but with ores that carry wet clay, slate, or other substances which will 'pack', it is necessary to use a swinging-jaw crusher, preferably of the Blake type. Rock-breakers may be set to crush to any desired fineness, but it has been found that too great a reduction in the size of the product materially reduces the capacity. In large crushers it is not usually advantageous to attempt to crush below 2-in. size.

First-class rolls are now always belt-driven, which eliminates the noise and danger attending the operation of the old-fashioned trains of gears. The best practice in roll crushing is to crush not smaller than half the diameter of the particles fed to any given machine. This rule gives approximately the maximum crushing capacity with the minimum production of fine and the lowest expenditure for power and metal. Rolls require a steady feed, and one which is uniform across the entire width of the shell; consequently nearly all modern rolls are equipped with some feeding device. In sampling mills the shaking tray is generally used on account of the ease with which the rate of feed can be inspected, and the great facility with which such feeders can be cleaned after each lot of ore has been run.

For fine-grinding machines, the coffee-mill type still successfully holds its own against most of the

adaptation of the ordinary hand-operated splitter in which numerous small spouts are so arranged across the entire width of a larger one that the main ore-stream is divided into a great number of smaller ones, the even numbers being deflected to the right and the odd numbers to the left. This plan works well on the first division, but as it effects a reduction of only 50% in the volume, the operation must be carried further, and the streamlets forming the sample centered into a broad stream, which, in turn, passes over another set of splitters, the operation being repeated as often as necessary to reduce the sample to the desired size.

The latest types of samplers are usually known as 'time-sampling machines', from the fact that they deflect the entire stream into the sample compartment for a varying portion of the time, depending on the percentage of sample required. Treating the falling stream as a ribbon, they cut sample sections directly across its entire width, these portions varying in shape and size with the mechanism employed. Of the many types that have been invented and patented, only three, the Charles Snyder, the Brunton, and the Vezin, have come into general use.

Both the Charles Snyder and the Vezin samplers have sector intake spouts revolving on a vertical axis, the only difference between the machines being

that the delivery spout in the Snyder sampler is an annular quadrant, *D*, in Fig. 1, while the Vezin delivery pipe is either square or rectangular, *E*, in Fig. 2. In order to take a correct sample the cutting edges of the sector intake spouts on both of these machines must be exactly radial, as shown in Fig. 1 and 2, otherwise they will include more degrees of arc at one part than at another; and consequently the percentage of sample taken from all parts of the delivery pipe will not be the same, as is shown by Fig. 3, in which the cutting edges are not radial to

feed to a sector intake this sorting action does not seriously affect the sample if the delivery spout is perfectly level and free from ridges which would deflect the particles across the stream; but with a radial feed used, as shown in Fig. 2, and the intake sample-spout edges not radial, as shown in Fig. 3, it will readily be seen that a larger proportion of coarse than of fine is taken into the sample.

Since the cutting edges of this class of samplers are necessarily maintained in a horizontal position, they are liable to become overhung with strings, burnt fuse, and drill-rags, which the mill attendants often endeavor to remove by pounding the sides of the spout while the machine is in motion, thereby distorting the form of the intake spout considerably from a true sector, and rendering it impossible to obtain a correct sample unless the delivery stream is perfectly homogeneous, which is never the case. The great length of the radial edges of the sector intake spout renders them, of course, peculiarly susceptible to be thrown out of alignment, and manufacturers of this class of machines should do something to shorten the length of the radial edges, or stiffen them to prevent accidental distortion. At first sight it might be thought that this could be accomplished by reducing the size of the sector, but experience has shown that the width of any spout delivery, or intake should be something more than three times the greatest diameter of the coarsest particle passing through it; otherwise a bridging effect occurs which affects the flow and often chokes up the spout. It is, therefore, good practice to make the width of the feed and intake spouts four times the diameter of the coarsest particles passing through them.

The Brunton time-sampler oscillates in a vertical plane through an arc of 120° instead of revolving in a horizontal plane like the sector-intake machines, an arrangement which permits the use of a rectangular intake spout with cutting edges so short that accidental distortion is impossible, while the tilting of the cutters at the end swing materially assists in dislodging any rags or strings which may have fallen on the cutting edges. This construction requires less head-room than any other

system, which effects a great saving in the cost of mill-construction, since it not only reduces the necessary height of the building, but shortens all spouts and conveyors. One advantage in the use of this machine is that, as the discharge of the ore from the sampler is assisted by centrifugal force instead of being retarded thereby, as is the case with all sector machines, it can be run at a much higher rate of speed, thereby increasing the number of samples per minute. This arrangement insures greater accuracy, since the more samples which can be cut from the falling ribbon without 'batting' the ore too vigorously with the sides of the cutters,

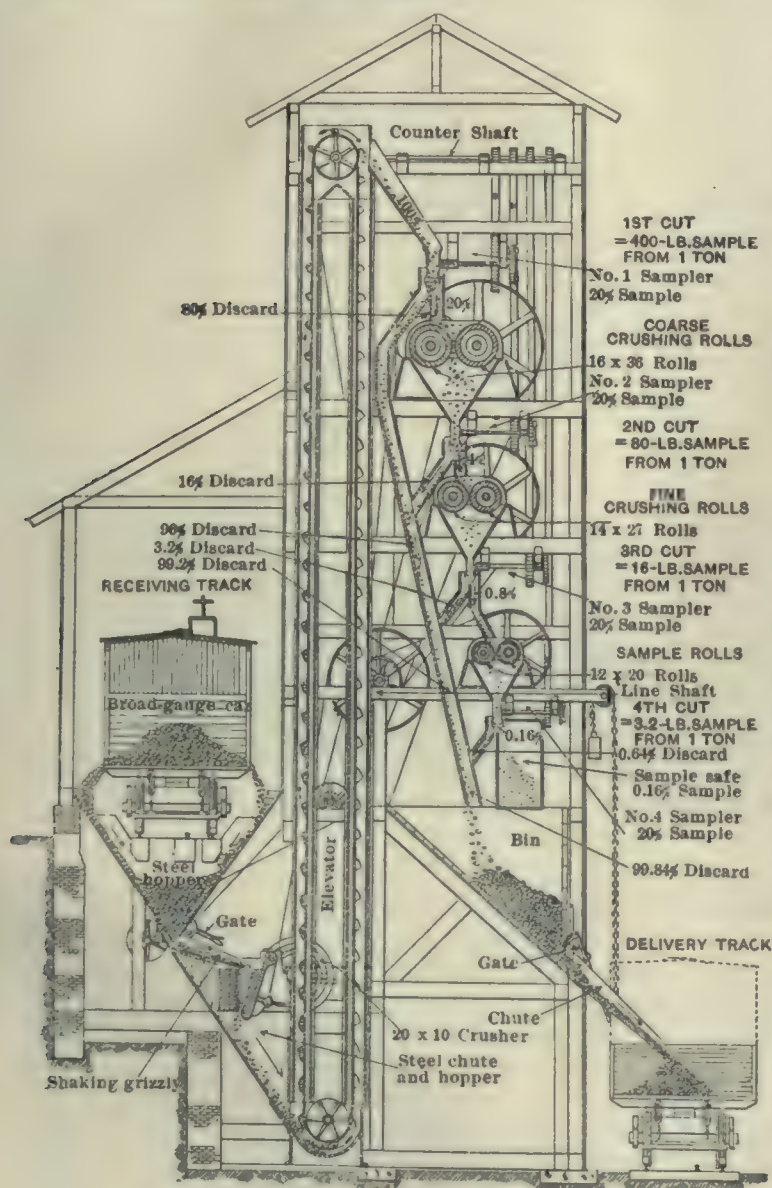


Fig. 4. Taylor and Brunton Sampling System.

the better are the chances for obtaining an exact average of the stream.

While there seems to be a general impression among mining men that high-grade ores are more difficult to sample correctly than those of low grade, there is no reason for this assumption. The difficulty of sampling accurately increases directly as the difference between the value of the highest and the lowest-grade material contained in the lot, and is at its maximum when the metals are carried in large masses of metallics or crystals of very rich minerals occurring in barren rock. If we imagine a lot, for instance, of Cripple Creek ore, composed entirely of barren gangue and one solitary piece of calaverite, it would be manifestly impossible to sample such a lot of ore without crushing, since in any subdivision either the sample or the reject would contain all of the mineral. Suppose this lot to be subjected to a slight crushing and the solitary piece of mineral broken into three fragments, then dividing the lot into halves would at the best throw 50% more value into the one half than into the other; it is therefore clearly manifest that in order to obtain a sample which shall correctly represent this or any other lot, it is necessary to crush it to such a degree of fineness that one particle more or less taken into the sample shall not materially affect its metallic content. In other words, the maximum error is determined by the ratio of the weight of the largest particle of metal or high-grade mineral to the weight of the entire lot. At this point another condition must be considered. In any lot of ore it is easy to see that the chances of finding a full-sized piece of the highest-grade material would be much greater on a lot of ore crushed to 0.25-in. cubes than in a lot crushed to 1-in. cubes, therefore accuracy demands that the ratio between the weight of the largest particle and the entire lot shall increase directly as the fineness.

In this particular, practice and theory are in complete accord, and all of the latest and most improved mills practice alternate crushing and subdivision from the coarsest size down to the finest. It is customary at each successive stage to reduce the diameter of the coarsest particles one-half, thus decreasing the volume to one-eighth, or 12.5%. The usual sample taken at each successive stage is 20%, so that while the size of the particle at each step has been reduced 12.5%, the amount of sample taken is 20%, consequently the ratio between the weight of the largest particle and the weight of the sample rises steadily from the beginning of the series of operations to the end, thereby meeting the conditions theoretically necessary to an accurate determination of value.

An ideal sampling mill, where the situation and nature of the service will permit this form of construction, is shown in Fig. 4. This plant is entirely automatic, and when the ore is received in hopper-bottom cars no manual handling is required at any stage, while the sample is automatically delivered into a locked steel safe. To simplify the drawing, the roll-feeders have been omitted.

To show how closely results between different mills and repeat-sampling in individual mills may be made to check, the following example may be cited:

SAMPLING RESULTS, TAYLOR & BRUNTON SAMPLING CO., CRIPPLE CREEK, COLORADO.

| Lot No. of mixture. | Original purchase. | | Mixture. | |
|------------------------|--------------------|-----------------------------|---------------------------------------|------------------------------------|
| | Weight, lb. | Gold assay, oz. per ton. | Mathematical average, oz. per ton. | Mechanical sample, oz. per ton. |
| 5394 | 17,588 | 0.98 | | |
| | 9,646 | 1.17 | 0.996 | 1.00 |
| | 11,348 | 0.875 | | |
| 5496 | 17,405 | 0.98 | | |
| | 6,615 | 0.895 | 0.972 | 0.975 |
| | 17,123 | 0.995 | | |
| 5799 | 422 | 8.24 | | |
| | 12,851 | 2.225 | 2.099 | 2.14 |
| | 175 | 8.50 | | |
| | 21,278 | 1.85 | | |
| 5890 | 19,090 | 1.925 | | |
| | 8,761 | 1.97 | 1.927 | 1.93 |
| | 8,852 | 1.89 | | |
| 3465 | 5,274 | 2.10 | 1.937 | 1.97 |
| | 17,935 | 1.89 | | |
| 3678 | 3,795 | 1.88 | | |
| | 17,122 | 1.49 | 1.481 | 1.52 |
| | 11,357 | 1.345 | | |
| | 6,592 | 1.465 | | |
| 3850 | 3,633 | 3.365 | | |
| | 16,803 | 4.675 | | |
| | 8,360 | 5.82 | 7.252 | 7.24 |
| | 11,222 | 3.73 | | |
| | 3,731 | 36.445 | | |
| 4170 | 18,605 | 0.83 | | |
| | 18,621 | 0.77 | 0.954 | 0.92 |
| | 11,937 | 1.42 | | |
| | 8,593 | 0.98 | | |
| 4292 | 17,848 | 1.165 | | |
| | 15,435 | 0.615 | 0.982 | 0.96 |
| | 17,436 | 1.12 | | |
| 4319 | 4,014 | 2.835 | | |
| | 15,611 | 2.24 | 2.71 | 2.75 |
| | 13,334 | 3.35 | | |
| | 11,712 | 2.58 | | |

The most convincing tests of correct valuation in ore-sampling are those, such as the one cited, in which numbers of small lots are bought and paid for individually, and stored for a considerable time, until a sufficient quantity of ore has been collected to form one large lot. When this period arrives the individual lots are not mixed, but run through the mill in succession, and it is usually found that the mechanical sample of the mixture agrees with the calculated average as determined by the values in the original purchases as closely as the best control assays. The small lots when originally received, sampled, and purchased are coarse and generally wet, but when run through the mill the second time they are both fine and dry, giving thereby the greatest possible dissimilarity in conditions of size of particles and moisture content. The excellent checks obtained on this class of work show conclusively that with 'time-sampling' the results obtained are in no way affected by the physical conditions of the ore, and may be implicitly accepted as correct.

The art of sampling has now reached a stage where a standardization of methods is both desirable and possible, and it is to be hoped that the Mining Congress, or the proposed Bureau of Mines, will take the matter under consideration

CONSOLIDATION OF MOTHER LODGE MINES.

Written for the MINING AND SCIENTIFIC PRESS
By W. H. STORMS.

Few gold mines are better known to the world than the Keystone at Amador City, Amador county, California, and few have a more enviable record of production. The Keystone became famous by reason of its long continued and heavy output of gold, its total production approximating \$17,000,000 since 1851, when the first claims were located. At that early day adventurers from every land and of every conceivable character had flocked in thousands to California, where, with frantic energy they began tearing down the 'everlasting hills' and digging into the rocks in search of fortune. Among this motley mob of pilgrims, a number of men, ministers of the gospel, who knew nothing of mining, but who in this respect were no worse off than the thousands of other adventurers around them, located a claim on the south side of Amador creek, up on the hillside, where massive slabs of greenstone protruded from the ground like huge tombstones in an ancient

adjoining property was acquired and added to the consolidation, and soon thereafter the Keystone began to pay, becoming in time one of the most important mines in the State. Its career of success has extended over an unbroken period of nearly 60 years. Notwithstanding this long-continued period of prosperity the Keystone is still a comparatively shallow mine, though its development is probably in excess of a total length of 12 miles. Much of the work of the earlier years is now caved, and is inaccessible. There have been sunk on the property not less than 6 shafts, only 2 of which are deep—the Patton shaft, down 1573 ft., and the South shaft with a depth of 1200, both being inclines. The Patton is the main working-shaft, and is the only one at present open from top to bottom. Its incline depth is 1573 ft. (1200 vertical), which is only one-third the vertical depth of the Kennedy vertical shaft, near Jackson, a few miles to the southward. The South and Central Eureka and the Argonaut mines are each about twice as deep as the Keystone, and the veins show no signs of weakness, so it will be understood that the prospects for the future of the Keystone in



Keystone Mine, Amador, California. Property of California Consolidated Mines Company.

graveyard. Running along the edge of the greenstones was a large vein of stained quartz, separating the greenstone from the slates which lie to the west of it. The miners called their claim the Spring Hill, so named because of the occurrence of a spring up the hill issuing from the vein. A second claim adjoining was taken by other men, who named it the Geneva.

One of the first mills to be built on the Mother Lode in California was that on the Spring Hill claim; but owing to its rude construction and to the miners' lack of knowledge of its proper operation, it proved a failure at first. Later, however, when improvements, suggested by experience, were made, things went somewhat better. Several custom mills, in which ore from various mines was crushed and amalgamated, were built in the neighborhood, but these early operations were far from satisfactory. Believing that by combining their efforts economy would result, the Spring Hill and Geneva claims were consolidated.

Meanwhile the Keystone claim had been located down in the gulch to the westward of the Spring Hill and Geneva, and the owners of the Keystone, at that time having more money, if less ore, than their neighbors, bought the former property, and it was called the Consolidated Keystone mine. Later other

greater depth are attractive, to say the least.

The Keystone mine is not developed, as many infer, on a single fissure, but consists of a number of fissures, or veins, some of them wholly in black clay-slate, some at the contact of the clay-slate and greenstone schist, and others in the greenstone country. Generally in these mines the greenstone in the vicinity of the fissures has been rendered schistose on one or both sides of the fissure. Often the schists approach a slaty cleavage, are black and lustrous, and sometimes difficult to distinguish from the clay slates. The latter, when not adjacent to a vein, are generally of exceedingly fine texture, finely laminated, hard and brittle, and usually may be split with facility to the thinness of sheets of paper. The schists split less freely, and can seldom be divided into sheets as thin as the clay-slates. Payable veins occur in both formations in the Keystone mine, as well as in the other mines of the Mother Lode in Amador county.

A few months ago the California Consolidated Mines Co., was organized to take over and operate under a single management the Consolidated Keystone mines at Amador, and the Wildman-Mahoney mines, another large property at Sutter Creek, together with a number of intervening properties. When the entire consolidation, as contemplated, has

been effected it will become one of the most extensive and valuable gold mining properties in the world. There are on these consolidated mines at present 140 stamps, in three mills, all of which, except 20 in the south end of the Keystone, are of light weight. The equipment generally is of ancient pattern, far less efficient than the modern type of gold-mill.

The California Consolidated Mines Co. has ambitious plans, but these are only such as are essential in the conduct of large operations along modern lines. They include repairing the Keystone incline shaft, and continuing it to 2500 ft., for which purpose new steel ropes were put on a few days ago; the sinking of three and probably four deep vertical shafts, at suitable sites along the Lode, one of which, the Emerson at Sutter Creek, is already down 620, and another, 1000 ft.; the construction of two or more large, modern, heavy mills aggregating 500 stamps; the building of a system of local railroads for ore transportation; the extension of the main line of the Amador Central railroad to the vicinity of the mines at Sutter Creek and Amador City, and numerous other betterments both above and below ground.

There are immense ore reserves in both the Keystone and Wildman-Mahoney mines. Much of this ore is low-grade, but will yield a substantial profit when the contemplated equipment is supplied. In addition to these reserves are smaller veins of higher grade ore, on which the mills are operating at present. There is considerable unexplored territory in both the Keystone and the Wildman properties, while the possibilities of greater depth in these mines, by comparison with the ore-occurrence as developed in the deep levels of neighboring mines, is very great. Some of the best mines of Amador county only became largely profitable below 1000 ft. from the surface, while the Keystone and Wildman are each but 1200 ft. deep vertically, and to that level have produced over \$20,000,000. What lies below is wholly unknown, but I believe it to be the best undeveloped mining ground today on the Mother Lode of California.

On the Mother Lode in Amador, the principal formations are slates, schists, and greenstone. The true slates are argillaceous; the schists and gray-slates are magnesian. These latter, often blackened by carbonaceous matter, are the result of the shearing, and to some extent the chemical alteration, of the greenstones. The greenstones are in part massive intrusions, and have been variously called 'diabase', 'andesite', and 'meta-diasite'. They are basic rocks, frequently olivine-bearing, with abundant augite. Their green color is due to the dissemination of minute particles and threads of chloritic and hornblende mineral (uralite probably). Other phases of the greenstones are masses of ancient breccia, or agglomerate, cemented in a finer ash into a hard, usually dense, and extremely tough rock. Still other masses comprise vast accumulations of ancient tuff, also now rendered dense and hard by metamorphosing influences. All of the greenstones, whatever their origin, on this lode, are found deformed, sheared, and altered into schistose and slaty rocks,

which are generally designated amphibolite schist.

Gold-bearing fissures are found in all of the rocks above described. Some of the veins are beautifully banded, and this type is frequently rich in gold. Other veins, particularly the larger ones in the schists and breccias, are massive, with no evidence of banding except occasionally along the edges of the mass. These orebodies, though generally of lower grade, are nevertheless sometimes surprisingly rich in gold. It is not uncommon to find rich pockets in these schists, the Keystone mine having become noted for them. Occasionally, as in the Mahoney mine, at Sutter Creek, sulphide ore of surprising richness is found in these veins. In the instance mentioned, solid sulphide ore worth over \$20,000 per ton was discovered in a vein in the schists in that mine. It occurred as a small vein about 3 in. wide in a larger vein of unusually good ore.

Mining on the Mother Lode in Amador county is in a more prosperous condition than for many years. Two of the old mines which had long been operated at a loss have within the year been placed on the dividend list, and this is what counts. I refer to the South Eureka and the Bunker Hill. The former is a mile south of Sutter Creek, the latter is the second property north of the Keystone. Other important developments are looked for in the mines of this vicinity, and I feel safe in predicting a great increase in interest in mining on this famous belt within the next 12 months. Among the latest developments are the Original Amador, adjoining the Keystone on the north; the resumption of work on the Muldoon property, adjoining the Argonaut on the south, and now known as the Kennedy Extension gold mine; the Treasure, formerly the Hazard, which is situated between the Bunker Hill on the south and the Fremont Con. on the north, and in the vicinity of Plymouth, the preliminary development of the veins in what is known as the Orr ranch, by Webb Smith, superintendent of the Kennedy mine, and his associates. Each of the properties mentioned has good prospects, and all who are familiar with the Mother Lode expect to see valuable mines developed at the places mentioned.

CHART OF IGNEOUS ROCKS.

Prepared for the MINING AND SCIENTIFIC PRESS
By STUART CROASDALE.

A few years ago Scott Turner published in the MINING AND SCIENTIFIC PRESS a chart of the igneous rocks, which was a simplified form of an elaborate tabulation by F. E. Wright.

I submit herewith a still more simplified chart, arranged from F. W. Clarke's 'Data of Geochemistry',* which may constitute a valuable accompaniment for Mr. Turner's chart, since it shows more clearly the relation of the rocks to each other. Those who wish to carry these charts in their note books will find that the full page of the MINING AND SCIENTIFIC PRESS can be reduced by photography to 4 by 6½ in. and still be easily legible. Prints of this size may be made from the negative and pasted in note books.

*Bull. No. 330, U. S. Geol. Survey.

| IGNEOUS ROCKS. | | |
|--|--|---|
| PLUTONIC. | INTERMEDIATE. | ERUPTIVE. |
| GRANITE-RHYOLITE SERIES. | | |
| <p><i>Granites.</i></p> <p>Holocrystalline. Dominant minerals: quartz and alkali feldspar (orthoclase or microcline). Subordinate minerals: muscovite, biotite, hornblende, etc.</p> <p><i>Aplite</i>, a granite with quartz and feldspar only.</p> | <p><i>Quartz Porphyries.</i></p> <p>Intermediate between the granites and rhyolites.</p> | <p><i>Rhyolites.</i></p> <p>Eruptive equivalents of the granites with same chemical composition. Quartz and feldspar, predominating minerals. Commonly contain more or less undifferentiated glass.</p> <p><i>Obsidian</i>, is the wholly vitreous variety of rhyolite.</p> |
| The difference between granites and rhyolites are structural and genetic; chemically and magmatically they are the same. | | |
| SYENITE-TRACHYTE SERIES. | | |
| The Syenite-Trachyte series differs from the Granite-Rhyolite series in being free, or nearly so, from quartz. All of these rocks contain principally alkali feldspars, with subordinate femic minerals, and often alferic species, such as hornblende, mica, etc. | | |
| <p><i>Syenites.</i></p> <p>Resemble the granites in their deep-seated plutonic origin and in being holocrystalline.</p> | <p><i>Syenite Porphyries.</i></p> <p>Intermediate forms between the syenites and trachytes, analogous to the quartz porphyries.</p> | <p><i>Trachytes.</i></p> <p>Like the rhyolites, they are eruptive rocks.</p> |
| NEPHELITE SERIES. | | |
| <p>These are transition rocks from the syenites and trachytes proper, to the phonolites and nepheline syenites. They occur in plutonic, intermediate, and eruptive groups like those above. Quartz is absent, and lenads, or feldspathoids (feldspars deficient in silica) replace the feldspars to a greater or less extent.</p> <p>Phonolite is commonly made up of orthoclase, nephelite, and pyroxene.</p> | | |
| MONZONITE GROUP. | | |
| <p>The Granite-Rhyolite series of rocks, and the Syenite-Trachyte series also, are defined by the predominance in them of alkali feldspars, and commonly of orthoclase.</p> <p>The Andesite-Diorite series (see below) is characterized by plagioclase feldspars.</p> <p>Between these series are all sorts of gradations known as <i>monzonites</i>. All these rocks carry orthoclase or anorthoclase and plagioclase in approximately equal amounts, with or without quartz, and with smaller amounts of the ferromagnesian silicates.</p> <p><i>Quartz Monzonite</i> corresponds with granite. <i>Latite</i> is an effusive equivalent, intermediate between the trachytes and andesites.</p> <p><i>Monzonite</i> corresponds with syenite.</p> | | |
| ANDESITE-DIORITE SERIES. | | |
| From the monzonite group to the quartz-diorites the gradation is very slight. These rocks, which mark the persilicic end of the Andesite-Diorite series, are characterized by quartz, with plagioclase as the prevailing feldspar, and with subordinate amounts of ferric minerals. They correspond to granite and rhyolite in the Orthoclase series. | | |
| <p><i>Quartz Diorites.</i></p> <p>Plutonic or deep seated like granite.</p> <p><i>Diorites.</i></p> <p>Plutonic equivalent of andesite. A granitoid rock consisting chiefly of plagioclase with either biotite or hornblende, or both. Many diorites carry pyroxenes and shade into gabbros.</p> | <p><i>Diorite Porphyries.</i></p> <p>Analogous to the quartz porphyries.</p> | <p><i>Dacites.</i></p> <p>Eruptive like rhyolite. Dacite is a quartz andesite.</p> <p><i>Andesites.</i></p> <p>Poor or lacking in quartz. They form a group of rocks parallel to the trachytes, and contain plagioclase as a principal constituent, with subordinate biotite, hornblende, and pyroxene.</p> |
| GABBROS. | DIABASE. | BASALTS. |
| <p>Granitoid equivalent of the basalts. Consist mainly of plagioclase and pyroxenes, with various admixtures of other minerals. A large family of rocks, varying from almost entirely plagioclase to near pure <i>femic rocks</i>, such as pyroxenites, hornblendites, and peridotites.</p> | <p>Intermediate in texture between the granitoid gabbros and the basalts. Consists chiefly of plagioclase, augite, magnetite, and sometimes olivine.</p> | <p>Contain more femic minerals than andesites. Plagioclase, pyroxene, magnetite, and often olivine are principal constituents. Hornblende rarely occurs.</p> |

COMMENCEMENT ADDRESS.

By JOHN HAYS HAMMOND.

*I am often asked what I regard as the essentials of professional success in mining. First and above all other considerations, I would place the possession of character. An honest, clean cut, straightforward, conscientious young fellow, ambitious, persevering, and last, but by no means least, level-headed, would in my judgment possess 75% of the essentials of success; while in relative importance I would not attach more than 25% to the possession of a technical education. And I say this without in any degree depreciating the inestimable value of a technical education. In the mining profession the adage, 'Make haste slowly' applies with unusual force. The tendency in recent years on the part of the mining engineer has been to neglect that practical experience so essential to the completion of its professional equipment. It is customary for the young engineer—after spending a few years in sampling mines—to enter the field as a 'mining expert'. The inevitable result is that he never acquires the practical knowledge that comes from years of experience in mines, mills, and smelters—knowledge indispensable to his subsequent work as an expert. There is today a scarcity of competent mine managers. The old hard-headed practical mine manager, who has worked up from the bottom and has acquired a thorough knowledge of all the phases of the mining business from actual experience, has been superseded by the graduates of the mining schools, who, in many instances, after but little experience step into the management of a mining company. And yet it is true that never before has there been found so highly competent mine managers as today. These are the men, who, after having received their technical training in the schools, have, like the old time practical miner, acquired an intimate knowledge of the subject through years of experience in subordinate positions.

Formerly the report of a mining engineer or expert was confined to the geological and other cognate features of a mining enterprise; today, the engineer is expected not only to embody in his report information on these subjects, but to give his opinion as to whether the property offered for sale is worth the price asked for it. He is indeed an engineer of but limited usefulness if he does not go farther professionally than to present a purely technical report on subjects submitted for his consideration. While the same responsibility obtains as formerly, in the solution of the technical problems, the expert has also to deal with the financial and commercial aspects of the problems. Moreover, if he recommends the purchase of a property he incurs a certain moral responsibility for its efficient management, inasmuch as his professional reputation depends on the realization of his predictions as to the outcome of his clients' investment. For this reason the engineer sometimes passes from the role of an expert to that of a consulting engineer.

For many years I have strongly advocated the

evolution of the engineer and expert into the 'mining man'. There is now interposed between the mining engineer and the investors a class of men known as promoters. To what I regard as the intrusion of these mine promoters I ascribe the failure of many mining enterprises. These promoters are, as a rule, men who have but a superficial knowledge of mining. Indeed, many of them have been failures in other walks of life, and have gone into this vocation because of the fact that it presents unusual opportunities of getting rich quickly. Not only are the majority of men in this class incompetent and ignorant but they are often unscrupulous. I recognize, of course, that there are among them many men who have a fairly good knowledge of practical mining and who possess undoubted integrity. I should like, however, to see the mining engineer acquire such a knowledge of business methods as to enable him to take the place of the mine promoter. This would insure mining investment upon a more conservative basis, thereby greatly minimizing the risk. To the engineer who in that way becomes the mining man to whom I have referred, an interesting and remunerative field would be opened.

I have noted of late, especially on the part of young mining experts, the exhibition of a sense of pride in having 'turned down' a great number of mining propositions. Now, I do not wish to encourage any zeal on your part to make mistakes, but I do wish you to base your claim for merit, not upon the negative virtue of not making a mistake by turning down properties, but upon the successful foundation of mining enterprises through your professional advice and direction. Do not be 'from Missouri' on every mining proposition presented to you. On the other hand, be not over-credulous and an easy mark.

As the President of the American Institute of Mining Engineers, I delivered an address about a year ago on 'Professional Ethics'. Some prominent members have dissented from my views on the subject and have reproached me for wishing to inject into the sphere of the mining engineer what they regarded as too much commercialism. Nevertheless I continue to regard mining as aimed to make a profit in the exploitation of mineral deposits, and I do not believe that the function of the engineer should be limited to the consideration of the academic features of mining problems. In the address, I referred to the propriety of the engineer making a report for the vendor of the mining property. Such practice has been, I know, generally condemned. But, a little reflection will show that the condemnation is not warranted, for it is neither wrong nor unreasonable that the owner of the mineral properties who desires to present such a statement of its nature and probable value as will insure the attention of contemplating purchasers, should, for the purpose, secure the assistance of one who knows how to make such a statement intelligently and in scientific language. Such a report should, however, be plainly designated a 'vendor's report', and the young engineer in making the report should use every precaution against the illegitimate or misleading use of its statements.

There arises also in this connection the question of the acceptance of contingent fees by the engineer. It

*Abstract from *Quarterly of the Colorado School of Mines*, delivered at Golden, Colorado, May 28, 1909.

seems to me that an expert of established and unimpeachable reputation is perfectly justified in recommending the purchase of a property and accepting compensation from the promoters, provided first, and without qualification, that full publicity be given to the nature of his connection with the enterprise, and second, that his compensation be contingent not upon the successful sale of the property, but upon the subsequent success of the undertaking. The acceptance of commissions from the sales of machinery, is another subject embraced in professional ethics. In many instances of a similar nature, affecting other professions, this practice seems to be established and condoned, if not avowedly justified; but in the mining profession I can see no justification whatsoever.

A young mining engineer should be as loyal to the corporation which he serves as to any individual. If he 'cannot stand for' the policies or practices of his employer, it would be the straightforward course to seek employment elsewhere. To retain the respect of his subordinates and thus assure the team work that wins in industrial undertakings, as well as on the athletic field, is quite as important for the engineer in charge of operations as it is to inspire the confidence of his employers. To be what is called a good mixer is an important qualification for the engineer. This is largely a hereditary trait, it is true, but the tendency to become exclusive and self-complacent can at least be overcome. Most valuable information as to mining developments and conditions in a new district can be acquired second-hand from even the unlettered stage-driver of the district, and many an important hint is dropped in a smoking car.

There are two distinct classes of mining ventures with which the engineer has to deal in his professional capacity. The first is the so-called 'gilt-edged' mining investments. Here the engineer exercises great conservatism, not only because there are relatively large sums of money involved, but also because investors in this class of mining are unfamiliar as a rule with mining risks. The second is a class which, while speculative, are honest and legitimate undertakings. The development of mining prospects belongs to this category. Ventures of this kind should be confined to those who are willing and can afford to take greater risks in the hope of larger profits than accrue from the 'gilt-edge' mining investments. If the engineer has already established the reputation of being successful in his mining ventures, and has formed a clientele, for whom he has made money in these enterprises, he can afford to take some chance in risking the money of his clients in this more hazardous class of mining propositions. Here I wish to impress upon you the necessity of exercising great discrimination in choosing the capitalists to be associated with you in these respective enterprises. As your experience expands in these matters you will appreciate the importance of this injunction.

In making reports the young engineer should present copious technical data in case the report is to be submitted to other engineers, but when it is for the capitalist he should have in view chiefly the presentation of economic facts. Many of the reports of young engineers are altogether too voluminous to at-

tract the serious consideration of a busy capitalist. I have often been asked by young engineers what fees they should charge, and, while I have conscientiously advised fees 'as large as the traffic would bear', I have always suggested that it is sometimes more important to establish professional connections than to ask for remuneration which might result in the loss of such connections. Also, the young engineer should sometimes sacrifice the immediate monetary advantage, in order to get information which will be of subsequent importance to him. But I have at the same time been averse to recommending young engineers to make trips in order to see distant countries to the sacrifice of more substantial remuneration.

Your time as students has been fully taken up along technical lines. It has not been possible to embrace non-technical subjects in the curriculum of a mining school. But as you achieve distinction in your profession, you will come in contact with men prominent in other fields of activity, and you will feel the lack of a broad education, unless you acquire it by study after graduation. If you are well-read and have been a student in the liberal arts, your standing in the community, and therefore your importance in your profession, will be immeasurably increased. Finally, discharge your civic duties. You should, without the undue sacrifice of your professional opportunities, participate in the political movements affecting the localities in which you reside, and the welfare of the nation. For upon the welfare of our nation depends in a very large degree the prosperous conditions under which we can best succeed in our professional vocation.

THE MADILL OIL POOL, OKLAHOMA.

A report by J. A. Taff and W. J. Reed on the Madill oil pool has been published by the U. S. Geological Survey. Up to April 20 four producing wells had been drilled in a single quarter section 1½ miles southeast of Madill. The largest producer is estimated to have given 400 bbl. per day. The crude Madill oil is very liquid, with a gravity of 47.5° B., or approximately 7° higher than the best oil produced at Muskogee and 13° higher than the average Mid-Continent crude oil. The principal oil-bearing rock in this region, and the only one which has produced oil in quantity, is a deposit of compact sand and gravel a little more than 400 ft. below the surface at Madill. The oil sands have been reported to be 40 ft. thick, but it appears that the exact thickness of the pay-sand may not be over 25 or 30 feet.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

H. E. G., Montello, Nevada: Amphibolite-schist with quartz veins.

H. O. Y., Bowman, California: No. 1, a metamorphosed feldspathic rock, apparently an altered rhyolite or aplite; No. 2, quartzite. Both rocks are considerably stained by iron oxide.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Glass is used for lining the bottoms of launders at the Boston Consolidated mill, Garfield, Utah. It does not rust, as would metal, and resists abrasion better than wood.

Chat is used in the Missouri-Kansas zinc district to indicate the refuse from the concentrating mills, particularly the coarser particles. These generally consist largely of crushed chert, but in southeastern Missouri the same term is used, though the material is dolomite.

A metal surface, no matter how well polished, will always show under a strong microscope many irregularities. These irregularities, scraping one over another, and constant crumbling away, cause hot and cut bearings. Flake graphite fills up all these irregularities, building up the low spots, and forming over all a thin tough veneer of marvelous smoothness, and if for any reason the lubricant should fail, there is graphite-to-graphite contact instead of metal-to-metal, and the parts may be in contact for a long time without danger.

Monuments are deemed essential to validate a mining claim, except in the case of placer claims taken up according to legal subdivisions. They should be marked, and readily identifiable, otherwise it may prove difficult to hold ground against an adverse claimant who has complied with the regulations strictly. As a matter of security it is well not only to properly monument a claim, but to have witnesses, so that the fact may be capable of being fully substantiated in case, for any reason, the monuments should be destroyed.

Aggregates for fire-proof concrete giving the most fire-resisting property to the material, according to the recent progress-report of the Committee of the American Society of Civil Engineers on Concrete and Reinforced Concrete, are crushed igneous rocks. This is criticised by John S. Sewell, who affirms that such rock often spalls badly, and may be less desirable than limestone, and far inferior to crushed brick, terra-cotta, slag, and cinders. Mr. Sewell also insists on caution in subjecting concrete fire-proofing to any important structural stresses.

Assessment work for the benefit of a claim but not performed thereon is accepted by the courts, when the evidence is conclusive that such work is done in good faith for the purpose of subsequently mining the claim in question, and actually facilitates the extraction of mineral therefrom. Before venturing to expose a claim to adverse location by such work it is always well to take counsel of a competent attorney; or if any doubt exists as to whether such work might apply, follow the course of absolute safety and do the statutory work on each and every claim.

Bower-Barffing of cast-iron or steel is a process for developing a skin of Fe_3O_4 over the surface of the

metal, and of such depth as to prevent further oxidation. It is accomplished by heating the articles to a temperature of 1600°F . in closed retorts in the presence of superheated steam. A coating of Fe_3O_4 and Fe_2O_3 is thus formed. The Fe_2O_3 is then reduced to Fe_3O_4 by flooding the retort with producer-gas. The process had considerable vogue at one time, but, although extremely efficient, it is expensive, the cost ranging from \$5 to \$20 per ton on the cast-iron articles treated.

Paint coatings average only 0.003 in. thick, yet such a film is required to withstand expansion and contraction of the underlying surface, and abrasion or wear from without. It must penetrate and cling to the surfaces to which it is applied and must also retard or prevent free access to the underlying surface of both moisture and atmospheric gases, which cause decay. Very evidently, then, the physical and chemical character of the pigment particles themselves, the paint vehicle, and the lumber or metal to which the paint is to be applied must all be carefully considered.

Safe working-pressure for iron and steel-plate pipes may be calculated by the following formula:

$$P = \frac{1}{c} \left(\frac{T}{R} \right) \div f$$

Where P is the safe working-pressure in pounds per square inch, T the tensile strength of the plate, iron being taken at 48,000 and steel at 62,000 lb. per square inch, t the thickness of the plate in decimals of an inch, c the factor of safety, usually assumed at 4, f the proportional strength of plates after riveting, the factor being 0.7 for double-riveting and 0.5 for single, and R is the radius of the pipe in inches.

Crushing gold-ore in cyanide solution has been practiced on the Rand, and in many places in the United States and Mexico. The tendency under such conditions is to produce amalgam that is hard, 'dry', and brilliantly lustrous. It is desirable to feed mercury to the stamp-mill to keep the amalgam from becoming too hard; mere dressing of the plates is usually insufficient. The solution will also attack the copper of the plate unless the amalgam is kept well built up. Removal of the amalgam with steel scrapers is, therefore, particularly injurious. The amalgam must be softened and removed in the usual way. If necessary steaming may be resorted to.

Loss of head in friction is proportional to the length of the pipe, is increased by the roughness of the interior surface of the pipe, varies inversely as the diameter of the pipe, increases nearly as the square of the velocity, and is independent of the pressure of the water. This is all expressed in the formula

$$h = f \frac{lv^2}{2dg}$$

where h = loss of head in friction in feet, l = length of pipe in feet, d = diameter of pipe in feet, v = mean velocity in feet per second, f = a constant varying with velocity and diameter of pipe, g = acceleration due to gravity, and $\frac{v^2}{2g}$ = velocity-head due to mean velocity of flow. Tables for value of f can be found in many text-books.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

RIGHT OF PROMOTER TO GIVE STOCK IN SETTLEMENT OF CLAIM.

The promoters of a mining corporation had the authority to give a person stock in the corporation in settlement of a claim held by him against the mining property sought to be developed, and as a bonus for his services in raising funds. And such action was ratified by the other stockholders in receiving their stock where they had the option to receive their money or take stock in the company.

Canney v. McAllister (Utah) 101 Pac. 985, May, '09.

GAS AND OIL LEASE—CONSTRUCTION.

A gas and oil lease provided that if gas was found in any well, sufficient to justify saving and casing, the lessor should have a sufficient supply for domestic purposes and the lessee the remainder. It also provided that: "If, however, the second party shall use, market or sell gas from any well producing gas, it shall pay therefor fifty dollars per year for and during the time such gas shall be sold, marketed or used, except for drilling or domestic use of parties leasing to second parties. Under this lease the court held that the lessee was liable for the stipulated rental if gas was used by it for any purpose other than the drilling.

Mathes v. Shaw Oil Co. (Kan.), 101 Pac. 998, May, '09.

LEASE OF MINES—WHEN IRREVOCABLE.

A lease or license to operate a mine under the Wisconsin statute regulating mining, is irrevocable after a valuable discovery or prospect has been struck, but if the miner shall forfeit his rights by negligence such as establishes a forfeiture according to mining usages, then the lessor may revoke it notwithstanding a valuable discovery or a prospect has been struck. This rule permits revocation after discovery for a particular cause, but whether or not the cause exists is to be determined by proof of mining usages. However, the statute provides other causes for forfeiture after discovery, such as concealing or disposing of ores or minerals, or concealing or disposing of 'mines or diggings' for the purpose of defrauding the lessor of his rent, or neglect for three days after notice and claim of rent to pay rent on ores or minerals 'raised' by the lessee or licensee.

St. Anthony Min. & Milling Co. v. Shaffra (Wis.) 120 N. W. 238, March, '09.

LOCATION OF PLACER CLAIM—NOTICE.

A notice locating a placer claim, which was partly printed and partly written, read as follows: "Notice is hereby given that the undersigned in compliance with the requirements of the Revised Statutes of the United States have this day located the following described placer mining ground, viz: Commencing at the S. W. ¼ of the N. E. ¼ of Section twenty-three (23) T. 14 N., R. 10 E., situate in the Brushing Mining District, County of Placer, State of California. This claim shall be known as the Canothus Placer Mining Claim. Located on the seventh day of September, 1905. (Signed)." The words "commencing at" were in the printed

form, while the balance of the description was written, and while it did not appear that these two words were inadvertently left in the notice, still from the testimony of the locators, it was clear that they intended to locate the south west quarter of the north east quarter of the section described and that the words "commencing at" were expressionless and to be disregarded. Under the rule that location notices should be liberally construed, having reference to the circumstances under which and the character of the parties by whom they are generally given, and that the purpose of such notice is to identify the land claimed with reasonable certainty, the notice was held sufficient.

Green v. Gavin (Cal.) 101 Pac. 931, March, '09.

Japan's Mineral Output.

According to E. G. Babbitt, of the consular service at Yokohama, the total output of the mining industry in Japan during 1908 totaled \$51,583,000, a decrease of \$1,829,800 compared with the preceding year. The details are as follows:

| Mineral. | Value. |
|---------------------|--------------|
| Coal | \$30,981,700 |
| Copper | 11,201,900 |
| Petroleum | 3,237,700 |
| Silver | 2,132,800 |
| Gold | 2,073,000 |
| Iron | 963,500 |
| Sulphur | 383,400 |
| Miscellaneous | 609,000 |

COMPANY REPORTS.

ALASKA PERSEVERANCE MINE, JUNEAU, ALASKA.

STATEMENT OF OPERATIONS FOR MONTH OF AUGUST 1909.

| | Tons. | Gross value, estimated. |
|------------------------------------|---------|-------------------------|
| Ore broken in stopes, August 1.... | 197,572 | \$502,825 |
| Ore broken during August..... | 41,000 | 127,100 |
| Total | 238,678 | \$629,925 |
| Ore milled during August..... | 14,143 | 28,644 |
| Balance | 224,429 | \$600,281 |

There was recovered in bullion \$1.465 per ton or 72.25%, and in concentrate 35.3c. or 17.50%, giving a total recovery of \$1.82 or 89.75%. The loss in tailing was 21c. per ton or 10.25%. One hundred stamps ran 30 days of 8 hours each. Feed assays in mill averaged \$2 per ton. The costs, including mining 41,000 tons, 158 ft. of development, general charges, and tramming amounted to 42.6c. per ton. The milling cost, including repairs, haulage, freight, and bullion charges was 37.1c. per ton.

CONSOLIDATED MINING & SMELTING CO., OF CANADA, LTD.

A summary report of the production of this company is given below. The largest part of the ore treated at the smelter is mined by the company itself at Rossland, Phoenix, Moyle, and Sandow.

| Quarter ending June 30, 1908. | | | | Year ending June 30, 1908. | | | | Quarter ending June 30, 1909. | | | | Year ending June 30, 1909. | | | |
|----------------------------------|-----------|-------------|--------|-------------------------------|-------------|--------|--|----------------------------------|-------------|--------|--|-------------------------------|-------------|--------|--|
| Metal | Quantity, | Gross | | Quantity, | Gross | | | Quantity, | Gross | | | Quantity, | Gross | | |
| Produced. | oz. | value. | % | oz. | value. | % | | oz. | value. | % | | oz. | value. | % | |
| Gold ... | 31,074 | \$637,017 | 50.97 | 121,380 | \$2,488,289 | 45.85 | | 41,474 | \$850,212 | 44.20 | | 114,920 | \$2,355,860 | 42.79 | |
| Silver .. | 463,457 | 246,145 | 19.69 | 2,224,888 | 1,288,992 | 23.74 | | 842,212 | 442,825 | 23.02 | | 2,443,475 | 1,261,842 | 22.92 | |
| | lb. | | | lb. | | | | lb. | | | | lb. | | | |
| Copper.. | 866,719 | 108,813 | 8.71 | 4,004,468 | 566,421 | 10.43 | | 1,457,957 | 188,719 | 9.81 | | 4,637,631 | 625,176 | 11.35 | |
| Lead ... | 9,349,750 | 257,740 | 20.63 | 32,157,139 | 1,084,799 | 19.98 | | 15,459,670 | 441,873 | 22.97 | | 43,675,077 | 1,262,648 | 22.94 | |
| Total value | | \$1,249,715 | 100.00 | | \$5,428,501 | 100.00 | | | \$1,923,629 | 100.00 | | | \$5,505,526 | 100.00 | |
| Tons | | | | | | | | | | | | | | | |
| Smelted. | | | | | | | | | | | | | | | |
| Lead furnaces..... | 11,310 | | | 39,954 | | | | 16,111 | | | | 61,398 | | | |
| Copper furnaces... | 55,452 | | | 266,002 | | | | 89,973 | | | | 313,069 | | | |
| Total smelted.... | 66,762 | | | 305,956 | | | | 106,084 | | | | 374,467 | | | |

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

ANNUAL REPORT OF THE SLUDGE ABATEMENT BOARD, 1907. Pp. 36. Melbourne, 1908.

MAP OF MADERA COUNTY, CALIFORNIA. State Mining Bureau, Ferry Building, San Francisco, 1909.

TUNGSTEN ORES OF CANADA. By T. L. Walker. Canada, Department of Mines, Mines Branch, No. 25, pp. 56. Ottawa, 1909.

COLLOID MATTER OF CLAY AND ITS MEASUREMENT. By H. E. Ashley. U. S. Geol. Survey, Bull. 388. Pp. 65, ill. Washington, 1909.

MAIN TUNGSTEN AREA OF BOULDER COUNTY, COLORADO. By R. D. George. Proc. Colorado Sci. Soc., Vol. IX, pp. 181-216. Denver, 1909.

THIRD ANNUAL REPORT OF THE BUREAU OF THE LOS ANGELES AQUEDUCT. Department of Public Works. Pp. 152, ill. Los Angeles, 1908.

An interesting report replete with valuable figures.

ELECTRIC SHAFT FURNACE, DOMNARFVET, SWEDEN. By Eugene Haanel. Canada, Department of Mines, Mines Branch, No. 32. Pp. 38. Ottawa, 1909.

An investigation of the operation of the furnace, with costs and figures.

GEOLOGICAL RECONNAISSANCE IN NORTHERN IDAHO AND NORTHWESTERN MONTANA. By F. C. Calkins, with NOTES ON THE ECONOMIC GEOLOGY, by D. F. MacDonald.

U. S. Geol. Survey, Bull. 384. Pp. 112, map, ill. Washington, 1909.

ORE DRESSING IN THE UNITED STATES AND MEXICO. By H. A. Guess. Proc. Colorado Sci. Soc., Vol. IX, pp. 235-258. Denver, 1909.

A general account with reports on numerous tests and with flow sheets of representative mills.

EXPLOSIVE MINE GASES AND DUSTS. By R. T. Chamberlin. U. S. Geol. Survey, Bull. 383. Pp. 65.

A thoroughly scientific study of a subject of large importance with notes having especial reference to explosions in the Monongah, Darr, and Naomi mines.

STRUCTURAL MATERIALS IN PARTS OF OREGON AND WASHINGTON. By N. H. Darton, U. S. Geol. Survey, Bull. 387. Pp. 33, map, ill. Washington, 1909.

This report includes a colored topographic map of Portland and vicinity and will be useful in all construction work.

IRON ORES, SALT, AND SANDSTONES. By G. P. Grimsley. West Virginia Geol. Survey, Vol. IV, pp. 603, ill. Morgantown, West Virginia, 1909.

The investigation shows the presence of large surface exposures of iron ore suitable for use in making open-hearth steel.

REPORT OF THE SLUDGE ABATEMENT BOARD FOR 1908. Pp. 31. Melbourne, Victoria, 1909.

This report contains accounts of hearings regarding stream pollution by mining debris with numerous determinations of the amount of matter carried in suspension by the streams.

STATE GEOLOGICAL SURVEY OF NORTH DAKOTA. FIFTH BIENNIAL REPORT. By A. G. Leonard. Pp. 278, ill., maps. Bismarck, 1908.

This excellent report includes an account of the coal resources, the cement materials, the road materials, the gas fields, and the general geology of the State.

MINERAL CONTENT OF ILLINOIS WATERS. By Edward Bar-

tow and others. State Geological Survey (Illinois), Bull. 10. Pp. 192. Urbana, 1909.

A general classification and study accompanied by numerous analyses and with notes on the geological distribution, industrial uses, and therapeutic properties of the waters. A handy book of useful information.

L. C. PRINTED CARDS, HOW TO ORDER AND USE THEM. By C. H. Hastings. Pp. 24. Washington, 1909.

The Library of Congress issues index cards covering the publications of the United States and the State Geological Surveys as issued. This pamphlet gives details and quotes costs. It may be obtained upon application to the Library of Congress, Card Section.

MINERAL RESOURCES OF THE UNITED STATES, 1908. U. S. Geol. Survey, Washington, 1909.

Advance chapters as follows have been recently received: Abrasive Materials, by W. C. Phalen; Asphalt and Related Bitumens, by J. A. Taff; Peat, by C. A. Davis; Coal Briquetting, Coal, Coke, and Coke By-products, by E. W. Parker; Graphite, by E. S. Bastin; Mica, by D. B. Sterrett; Mineral Paints, by E. F. Burchard; Mineral Waters, by Samuel Sanford; Petroleum, by D. T. Day; Precious Stones, by D. B. Sterrett; Salt and Bromine, by W. C. Phalen; Tin, by F. L. Hess.

GEOLOGICAL MAP OF OHIO. By J. A. Bownocker. Scale 8 miles to the inch. State Geologist, Columbus, Ohio. Price, 25 cents.

The last previous geological map by the State Geological Survey was published in 1888. The new map shows much additional detail regarding the formations, and a large amount of information of economic character. Among other features are the oil and gas-producing areas, the railroad and river-shipping coal mines, portland cement plants, salt works, and the gypsum deposits. The publication of such maps is among the most useful functions of geological surveys.

STRUCTURAL DETAILS, OR ELEMENTS OF DESIGN IN HEAVY FRAMING. By Henry S. Jacoby. 8vo., pp. 377, ill. and plates. Index. John Wiley & Sons, New York, 1909. Price \$2.25.

This volume represents the course given by the author upon this subject in Cornell University. It is a systematic treatise on practical design and execution of work in timber-framing for large structures. A knowledge of the principles of mechanics is assumed throughout. Great stress is laid upon the design of joints, beams, and trusses, many details being given, and illustrations in profusion elucidate the text. It is a work which will be an aid to every mill constructor where steel framing is not possible.

GOLD REFINING. By Donald Clark. 8vo., pp. 125, ill., index. Melbourne, Australia, Australian Mining Standard; London, Isaac Pitman & Sons, Ltd.; 1909. Price \$4.

This is a small book, but full of meat. Donald Clark writes from fullness of information, knows what he wants to say, and says it simply and in few words. The brevity of many of his references to points in technical method is extreme—only a line or two—but on examination it turns out that he has stated all that is worth while, and quite enough for any trained man to successfully carry out the operation indicated. As a single example, he says of purifying gold bullion, "one method consists in retorting with iron-filings, the object of the iron-filings being to remove the sulphur. This cannot be done at the temperature attained in retorting." A general review of refining with oxidizing and chloridizing agents is given; a chapter is devoted to sulphur refining, another to cementation processes, and one to refining with oxygen or air. Miller's process of refining with chlorine gas, practised with great success at the Sydney mint, is given in detail, aided by illustrations. The range of the treatise will appear from the further topics, parting with nitric acid, recovery of silver from nitrate solutions, refining by means of sulphuric acid, parting gold by electrolysis, electrolytic refining of gold, treatment of cyanide precipitate, nitre-cake method of purifying slime, and the refining of base bullion. It is an admirable little work, full of information and suggestiveness.

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TABLE OF CONTENTS.

| | |
|---|-----------------------|
| EDITORIAL: | Page. |
| Notes | 605 |
| The Copper Situation..... | 606 |
| Mr. Heney's Defeat | 607 |
| BY THE WAY..... | 608 |
| ARTICLES: | |
| Natomas 1500-Ton Plant for Crushing Dredge-Tail- ing | George Bowers 609 |
| Drilling for Oil in Eastern Illinois..... | E. S. Blatchley 613 |
| Freezing Method for Restraining Mine-Waters..... | Edward H. Nutter 617 |
| The Forest Service and Mining in the National For- ests..... | W. W. Dyar 618 |
| Disseminated Chalcocite Deposits at Ray, Arizona. | C. F. Tolman, Jr. 622 |
| Care of the Gas Engine..... | L. H. Snyder 624 |
| Permissible Explosives | 641 |
| Boston Consolidated Mining Company..... | 641 |
| Spring Stamps | 642 |
| DISCUSSION: | |
| Idle Mining Claims..... | Victor G. Hills 625 |
| Carbons for Diamond Drilling..... | Importer 625 |
| Economic Conditions in Colombia..... | Ernest H. Vaughan 625 |
| A Russian Money Trust..... | C. W. Purlington 626 |
| Colloids and Adsorption..... | E. K. Soper 626 |
| CONCENTRATES | 627 |
| SPECIAL CORRESPONDENCE | 628 |
| GENERAL MINING NEWS..... | 634 |
| DEPARTMENTS: | |
| Personal | 639 |
| Market Reports | 640 |
| Commercial Paragraphs | 642 |
| Publications Received | 642 |

EDITORIAL.

BENGUET, in the Philippines, is becoming an im-
portant producer. The Benguet Consolidated
is now yielding, approximately, \$6000 per month. In
the Paracale district the French seem likely to fol-
low New Zealanders and Americans in investing. At
Manila they are talking ambitiously of a million dol-
lar gold output for the year. The mining industry
of the Islands seems to be in a healthy condition.

THE SECOND number of *The Mining Magazine*
sustains the high standard set by the first. Mr.
T. A. Rickard writes in his usual lucid manner of
Hydraulic Mining in Alaska, Mr. W. E. Hindry gives
a pen-picture of the Esperanza mine, Mr. C. H. Jones
contributes a frank account of difficult work in
copper smelting in the Argentine, and 'an Occasional
Contributor' writes of Mining Accidents in Cornwall.
The reviews, company reports, and précis of technol-
ogy, illustrate excellently the good work which falls
within the peculiar field of a magazine, as does also
the mining review of the month.

WE TAKE PLEASURE in announcing that Mr.
C. F. Tolman, Jr., has joined our staff of
Special Contributors. Mr. Tolman has special knowl-
edge of the copper camps of Arizona, and we publish
a third of his illuminating descriptions in this issue.
In future contributions he will discuss the Miami-
Inspiration and Silverbell districts. A graduate of
the University of Chicago, with experience in chem-
ical work at Butte, in mine management in Mexico,
and in teaching at the Arizona School of Mines, Mr.
Tolman brings to all that he writes a penetrating
insight. He has already received a hearty welcome
from our readers.

CONSTERNATION has been brought to the oil
prospectors in Mexico by a clause in the tariff
bill now under consideration by the Chamber of
Deputies. The proposal is to admit the importation,
without payment of duty, of raw materials destined
to be manufactured, adapted, or modified within the
Republic for the purpose of exportation in whole or
in part. No specific mention is made of oil, but the
measure is gratifying to the Pearsons, who are
equipped for refining, and it is pointed out that the
importation of crude oil from the United States, and
the exportation of a part of the refined products to
Europe, selling the remainder in Mexico, would be
a profitable business. It would, however, discourage
prospecting, and prove a crushing blow to the smaller
producers. The excuse offered for this proposed
law is the inadequacy of the developed oil-supply for
domestic Mexican needs, but the amount of explora-
tion in comparison with the area where oil may be
expected is too insignificant to justify legislation at

this time that must impede further investigation on a scale which would prove or disprove the possibility of Mexico producing her own supply. If the facts are as represented the good sense of the Mexican Government will forestall such crippling of a rising industry which has proved attractive to foreign capital. That country has more to gain for a long time to come from developing her own resources than from merely manufacturing the raw materials of others.

IT IS ANNOUNCED that the gold medal donated by the Consolidated Gold Fields of South Africa and awarded annually by the Institution of Mining and Metallurgy, has been given to Mr. W. A. Caldecott "in recognition of his work in the investigation of methods of reduction and treatment of gold ores, and of his contributions to the literature of the subject." Mr. Caldecott merits the high distinction. He works in the true scientific spirit, and the advances in metallurgy made under his direction constitute forward steps in practice. His examination of Mexican methods of cyaniding silver ores attracted wide attention in this county and had an important influence in stimulating further research by our own metallurgists.

COMMENDATION is due General Bernardo Reyes for his patriotic self-effacement in not only withdrawing from the vice-presidential race in Mexico, but in temporarily retiring from the country. No other course could have been trusted to extinguish intemperate zeal on the part of the Reyista faction. While revolution was not to be apprehended, hot-headed political demonstrations would have given color to alarming reports had General Reyes remained at home. Such reports would have lowered the National credit and have impaired the growth of industry. The opponent of the administration gracefully accepts employment under the Government as special commissioner to study European military methods, and will remain abroad until after the elections.

FORESTRY and mining should go hand in hand, despite minor points of inevitable conflict. Actually, so far, the Forest Service and the miners have been in almost constant disagreement. The American Mining Congress, some time since, appointed a committee to confer with Mr. Gifford Pinchot, the Forester. A number of conferences were held and many points of disagreement were eliminated. It is understood that the remaining difficulties, relating in part to the use of timber taken from one unpatented claim to develop another, are to be discussed at future meetings between representatives of the Service and a new committee authorized at the Goldfield meeting. In the meantime we present in this issue the substance of an address made at Goldfield by Mr. W. W. Dyar, representing the Forest Service. Its fairness and breadth of view will be at once recognized by all who have watched with growing concern the friction generated by the past administration of the National Forests. For the benefit of those to whom Mr. Dyar is a stranger, we may say that he was trained as a lawyer, but got

an intimate knowledge of mining conditions later while managing dredges and hydraulic plants in Summit county, Colorado. He has learned by experience what are the difficulties of mining, even to the point of having himself been in conflict with the Forest Service. His appointment as law officer in the Service, and his detail to consider the especial questions that arise in connection with mining problems in the Forests, are the best possible evidences of the desire of the Forest Service to right as far as may be the real wrongs of the protesting miners.

The Copper Situation.

A prominent producer of copper the other day characterized the situation as 'delicate'. Prices are decreasing while prosperity is supposedly in the ascendant. This proves some peculiarity in the metal market that the public imperfectly comprehends. Spelter has risen sharply as a result of tariff changes and in response to demands for galvanizing sheet-iron; steel continues below the average prices in 1907, and copper is at low ebb, with stocks steadily accumulating. It is affirmed that the consumption increased in October, but this was due to the inducement of special prices made to secure large orders. Electrolytic copper has recently sold as low as 12½ cents. The available world-stocks are estimated at 400,000,000 pounds, which is more than one-fifth of the total annual production. As a result buyers are in the market only to supply current needs, the manifest expectation being that prices will recede. This must be disappointing to the cheerful prophets of 15-cent copper by January 1. Since the average cost of producing copper throughout the world is at present nearly 11 cents, curtailment of output is imperative. In this necessity lies an obstacle to forming an association of copper producers; it would chiefly benefit those who are writhing under the pinch.

The bankers are growing fearful of carrying the burden of excessive stocks of copper, and the contango, which is the price paid for deferring fortnightly settlements in the London market, has mounted to 22 shillings 6 pence per long ton. This will quickly involve the copper producers in unsupportable difficulties. The hard terms exacted have been partly occasioned by the advance of the Bank of England discount rate to 5 per cent, a penalty imposed upon the reckless stock speculation in Wall Street during the last two or three months. Trading in copper warrants has long been a favorite form of speculation in London, and efforts have been made recently in this country, particularly in Boston, to secure the co-operation of the public in helping to carry the load of overproduction in the same manner. We believe the response to this invitation has not been cordial. The burden of the copper miners cannot be shifted easily to other shoulders, and no relief can be obtained by mere restriction of the output at individual mines. The attempt to do that only increases the cost per pound of the lessened quantity. On the other hand, closing of mines means enormous losses from injury to underground workings and from deterioration of plant, or else continuing costs for pumping and preservation of equip-

ment. The anxiety of the operators to avert actual suspension of work is thus seen to proceed from motives of economy, and in many cases it will prove a better business policy to continue production at some actual loss.

As opposed to this stands the fact upon which we have commented optimistically from time to time, that those who presumably should know the present situation best, and should be best able to forecast the future, have been acquiring new properties, and expending millions in providing equipment for increased production on an enormous scale. The construction of the smelter in Pine canyon, Toole county, Utah, by the International Smelting & Refining Company, the equipment of the Miami and Ray properties in Arizona, to mention only a few, can safely be accepted by the public as evidence of faith in things unseen—at least in things beyond the clouded vision of the man in the street. Messrs. T. F. Cole and J. D. Ryan must have confidence in high prices at no far off period, sufficient to reimburse them for courageous investments which at present offer no visible profit.

Until the consumption of steel increases markedly no important improvement in the copper market can be anticipated. The earnings of the Steel Corporation have notably augmented on a tonnage inferior to that of two years ago. This result has been obtained through reduction of costs by means of the facilities afforded at the new Gary plant. Advantage was taken of these improvements to reduce the price of steel, which has had a beneficial effect on business in general, though its influence seems not to have stimulated new enterprises which would react favorably upon the demand for copper. Conditions at the moment are unpropitious for a decided revival. The impression prevails that the copper producers are in stress of circumstances. That means that consumers are counting upon a further break in prices. While that opinion prevails orders for future delivery will not materialize, and these constitute the basis for real vitality in any industry.

Mr. Heney's Defeat.

Reform has received a backset in San Francisco. At the election November 2, Mr. Francis J. Heney, candidate for the office of District Attorney, on the platform 'Equality before the law', went down to defeat before Mr. C. M. Fickert, running on the platform 'Let us have peace'. At the same election Mr. P. H. McCarthy, Union Labor candidate, a partisan and defender of Schmitz and Ruef, was elected mayor on a platform demanding a wide open town. It will be hard for friends of San Francisco at a distance to understand how this was brought about without any suspicion of the fairness and honesty of the election. Ever since the graft exposures began in this city Mr. Heney has been at the storm centre. He found here a nasty situation and he has fought valiently and steadily to better it. He fought the Devil with fire. Whether it would have been possible to accomplish anything by using cologne instead may well be doubted, but the fact remains that such fighting here, as always, produced resentment, engendered bitterness, and led to defections from the ranks of

those who ought to have stood solidly behind efforts at reform. More than that, to the large element which measures only by results, nothing direct seemed to have been accomplished. None of the grafters has been sent to prison. While it is true that indirectly much good has been achieved, the people as a whole evidently do not see this, and the charge of ineffectiveness has been lodged against the graft prosecution. This failure is generally ascribed to Mr. Heney's methods without much regard to whether or not any other methods were possible or would have brought larger results. It was this, we believe, which operated to defeat Mr. Heney personally. It was inevitable. The public repeatedly uses a man, accepts his results, blames him for failure, and casts him aside. Mr. Heney has too much experience and good sense to do other than accept the situation philosophically. He can no longer fight officially, but we are glad to see he has already enlisted in the ranks. Americans love a good fighter—and a good loser, and by these and many other tokens, Americans love Mr. Heney and wish him well.

Entirely aside from the personal opposition to Mr. Heney, there were general and underlying causes which insured the defeat of the candidates of the Good Government League. It is well to remember that American cities, despite family quarrels, are insistent on presenting a united front to outsiders. Local strife which affects the material prosperity of the city becomes unpopular, no matter how worthy the cause. This made effective the appeal of Mr. Fickert for a 'get together spirit.' The city was tired of strife and deliberately decided it were better to drop the graft prosecutions than to keep them up at that cost. We can only hope that the future may have in store some such delightful surprise as came to Chicago when Mr. Wayman was elected State's Attorney to stop attempts to enforce the Sunday-closing law. He stopped them, it is true, but has created consternation among jury-fixers, has sent a prominent police inspector to the penitentiary for black-mailing prostitutes, has forced the resignation of a complaisant Chief of Police, and has cleaned up the worst features of the red-light districts. Mr. Fickert would do well to study Mr. Wayman's career and growing popularity. There is plenty to do in San Francisco, even if the graft prosecutions be stopped.

As for the new mayor and the business men who either directly or indirectly made sure of his election, we can only re-affirm our opinion that even on the narrow basis of business it is a vast mistake for a city to elect a chief magistrate pledged to a wide open town, 'reasonable construction' of 'stringent and unreasonable ordinances' with the emphasis on the 'pleasure-loving' character of the people. San Francisco must sell bonds to carry out the public improvements under way, and with the memory of Schmitz and Ruef fresh in mind, we anticipate that the bond market will be tight.

General reform is bound to go ahead. We refuse to be discouraged. The advance or retreat of a single wave does not measure the direction or force of the tide, and we believe as firmly as ever that the tide sets deep and strong toward better government.

BY THE WAY.

At the inauguration of the Graduate School of the State University of Illinois, Mr. David Kinley discussed the subject of 'Democracy and Scholarship'. We abstract this address below:

The most noteworthy fact in nineteenth century history is the onward sweep of democracy. It has shown itself not only in the formal establishment of republican forms of government, but in the virtual establishment of the power of the people in countries where aristocratic and monarchic forms of government have been maintained.

Democracy has not won its way, however, without arousing a good deal of criticism. There are prophets, not a few, crying in the wilderness of exploded political and social conditions that the success of democracy means the decay of refinement, the destruction of the higher ethical, intellectual, and spiritual motives and ambitions; and the substitution of the gray gloom of mediocrity, in all departments of life, for the brilliant, if sometimes flaunting, diversity and exuberance of talent and activity that are fostered in the supposedly more genial atmosphere of an aristocracy. Nor are these critics of democracy so unimportant as to deserve scant attention. It is asserted with much show of logic and much parade of evidence that democracy and scholarship are irreconcilable. It is hardly worth while to criticise the somewhat preposterous statement that aristocracy favors culture more than democracy. For, in the first place, aristocracy as a form of government and of society has had a far longer lease of life in the world's history than has democracy, so that a fair comparison can not be made. Moreover, we certainly can not say that the members of any aristocracy have been the developers of culture, or its exponents. It is probably true that more of them have been devoted to the racing track than to poetry and art, and to the exploitation of the rest of society by war and government than to the promotion of their interests by letters and the arts. The long list of names great in science, art, poetry, literature, and philosophy is composed largely if not mainly of those of poor men of the middle or lower class. The only sense in which it can be claimed that an aristocracy is favorable to culture is that its members act as patrons of culture and have aided its devotees.

Later prophets warn us that democratic materialism, commercialism, and the demand for the practical are killing pure science and throttling literature. But yesterday a Cassandra voice in our midst announced that there is no scholarship in this democratic country of ours. When these critics are told to look about them and see what this democratic people of ours is doing to promote higher education and to stimulate scholarship and research by their great public school system and their State universities, unable to deny the facts, they take refuge in a subterfuge. They tell us as did an Eastern university president, that while it is true that many of the States are promoting higher education, it is a kind of higher education which is not consonant with, but antagonistic to, culture. We are told that the State universities may develop practical education, that

from them we may look for great results in engineering and in agriculture, and in all those matters which are sometimes criticised as 'bread and butter' studies; but for things of the spirit, we must look to those institutions which depend for their existence on private beneficence; that only here, free from the agitation and the tyranny of a democratic majority, can we hope that the pure light of learning will be kept burning. This criticism involves two assumptions, the mere statement of either one of which makes the whole position ridiculous. If the criticism be true, then it must be that the choice spirits are to be found at endowed universities only, or else it must be that the people, the democratic majority, refuse to have culture in their State institutions, an assumption which by no means is justified by historical facts or *a priori* theory.

In spite of all these criticisms, however, democracy is reaching out and taking possession of the field of higher education. I venture to put forward and to defend the thesis, not only that democracy is not incompatible with high scholarship in any line, but that, on the contrary, the cultivation of scholarship by democracy is necessary to its stability, progress, and perpetuation. I assert that, using scholarship in a broad sense, the permanent interests of developed democracy demand that the pursuit of knowledge shall be made in its own interest, by its own servants, supported by itself, to the end that knowledge shall become the general property of the community.

There is truth in the charge that scholarship has not developed in the United States, which may be regarded as a representative modern democracy. It is true that we are suffering now-a-days from an excess of materialism, from the arrogant assertions of positivistic science over imagination and spirituality; from the subjugation of idealism to realism, and from the too great importance attached to mere material prosperity. But it is not alone the greatest democracy of the world that is thus suffering, although perhaps it suffers more than others. The condition exists throughout the civilized world, and we hear protests against materialism from the apostles of the ideal in every country. It is a passing phase of civilization. Civilization does not move forward equally in all directions at the same time. It develops first on this line, then in that direction, and later on still another plane. The great geographical and industrial discoveries of the past century have put emphasis upon material growth for the present, and the light of things spiritual seems low by contrast. But that light has not gone out. Mankind has seen similar conditions before, and now, as hitherto, they are but temporary. In the United States, particularly, men have been obliged by the conditions attached to life in a new country to devote themselves to the pursuit of economic success. A nation, like an individual, can do only one great thing at a time. Our work during the first century of our existence was that of the conquest of a continent. In the second place, democracy has not until lately joined itself with the educated classes for the promotion of scholarship, because it has distrusted scholars and scholarship for the reason that in the past they have been the allies of aristocracy.

NATOMAS 1500-TON PLANT FOR CRUSHING DREDGE-TAILING.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE BOWERS.

The rock-crushing plant recently installed at Fair-oaks, California, by the Western Engineering & Construction Co. of San Francisco for the Natomas Consolidated makes possible the utilization of the rock-tailing piles from the company's gold dredges. These rock piles rise 20 to 45 ft. above the original ground level and cover many hundreds of acres along the American river and also along the Feather river near Oroville. This land had never been valuable for cultivation, only 10% being so used; and, although the gold dredges left it entirely barren, it was no great loss.

By the present system, however, all the mineral resources of the land are utilized. The great piles of rock tailing are put through the crushers and sold for road-metal, railroad ballast, concrete, etc., and

portance of a co-product. The rock is of good quality and is pronounced by experts to be the finest road-ballast obtainable in California.

The introduction of many novel features in the arrangement of the rock-crushing plant, which was designed as well as erected by the Western Engineering & Construction Co., has rendered its operation so simple and direct as to be almost automatic.



Bucyrus Steam-Shovel Loading Tailing.



Storage Piles for Crushed Tailing.

the land once 90% barren and useless is transformed into valuable orchards, vineyards, and eucalyptus groves, capable of supporting a large population. The Natomas Consolidated, which is the largest gold dredging and reclamation company in California, quickly realized the advantage to be gained by clearing away these piles of tailing and putting all the dredging ground under cultivation. Last year the company planted 1600 trees on this ground, and they are all in a healthy condition today, not one having died. They are shown in one of the illustrations.

The economic advantages of the new industry developed here have proved more numerous and more important than was at first expected. The unsightly useless gravel area is being converted into tillable soil; the region is being re-forested, and occupation has been furnished to a number of laborers and mechanics. Beside all these, the returns from the sale of the rock has proved so profitable that this industry has been lifted from a by-product of the gold dredging to almost the im-

The Natomas Consolidated owns and operates three rock-crushing plants, having a total output of 115,000 tons per month.

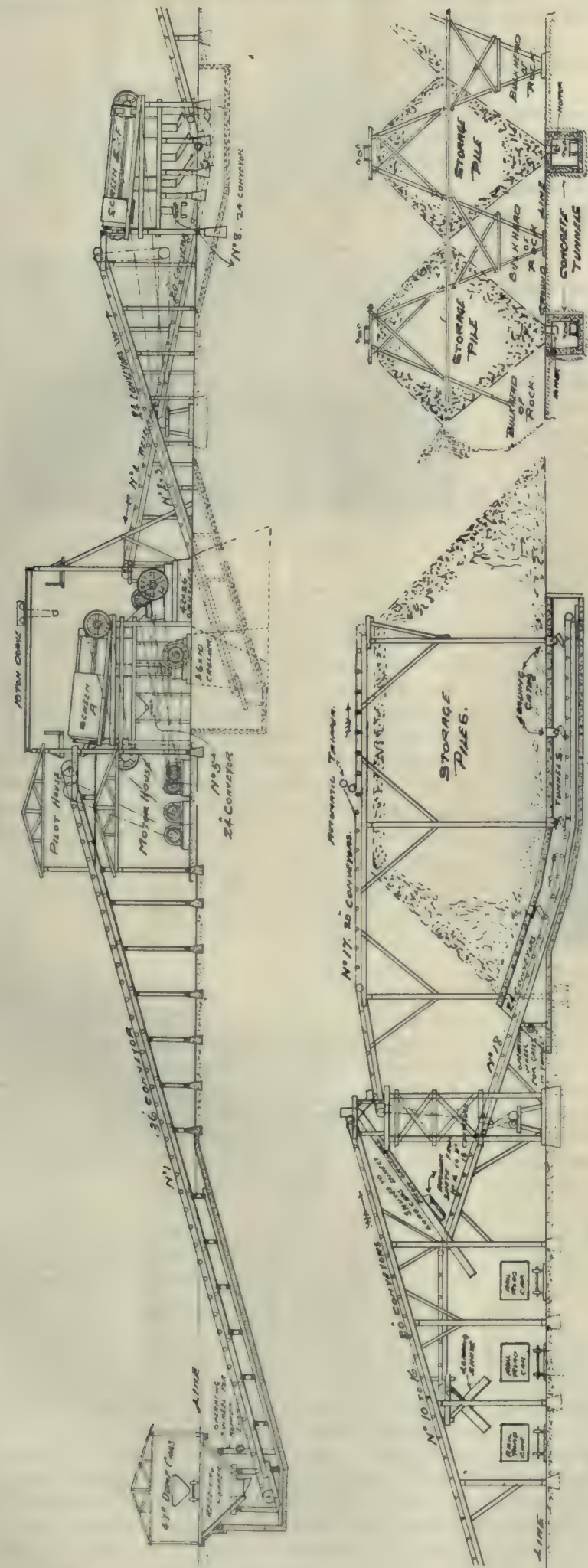
The rock-crushing plant known as No. 2 has a capacity of 1500 tons per day of 10 hours. The general arrangement of the plant is shown in the figures. The rock in the tailing piles to be crushed is excavated by means of a 40-ton Bucyrus, oil-burning, steam-shovel, mounted on 60-lb. rail, standard-gauge, portable track, parallel with the rock-pile. The rock from the shovel is deposited in a train of Koppel cars, each of 4 cu. yd. capacity, mounted on 40-lb. rail, narrow-gauge, portable track, in a



Crusher Plant for Dredge-Tailing.

loop to enable the loaded and empty cars to pass each other without the necessity of switching while returning to the shovel for a new load. The cars are hauled to and from the shovel by means of a 10 by 14-in. dinky engine, burning oil as fuel.

This loop and its relations to the receiving hopper are shown on the accompanying flow-sheet. The



Section Through Natomas Crushing Plant for Dredge-Tailing.

plete plant is ready for operation again. There are seven separate storage piles of crushed rock, each 100 ft. long by 40 wide and 40 high. The size and class of material is as follows, 3/8-in. to dust, 3/4, 1 1/2, and 2 1/2-in. rock, all which is an A1 product from the jaw-crushers. The material from the rolls is a second-class product in sizes of 3/4 and 1 1/2-in. rock. The seventh rock pile is composed of 3/8-in. round pebbles screened direct from the tailing pile, without being crushed, and is used as roofing pebble.

In the centre of each of the seven storage piles, below the ground-line, is a re-inforced concrete tunnel, 110 ft. long, 6 ft. wide, and 6 ft. high, inside dimensions, having the roof and sides and bottom 12 in. thick. Each tunnel is provided with a 24-in. Robins conveyor, 185-ft. centres, running at a speed of 250 ft. per minute, the conveyor raising from the ground at an angle of 18° to a height of 25 ft., and then running parallel to the ground over the railroad tracks for a distance of 25 ft., discharging into a swinging chute, so placed as to direct the rock alternately into the railroad cars on two distinct tracks. Each tunnel is provided with four gates, spaced 20 ft. apart. The gates are of the swinging-door pattern, and all gates are connected by means of levers and rods, and can be operated separately or together from one hand-wheel at the mouth of the tunnel. The third track is loaded direct from the crushers by means of an inclined chute from the head of the conveyors, from No. 10 to 16 inclusive; also an auxiliary chute is installed in the aforesaid chute at the lower end to divert the material when necessary to discharge to the No. 18 conveyors and thereby load the cars on the first and second tracks. With the above arrangement it is possible to load cars on two separate tracks from the storage-piles, and also it is possible to load cars on three separate tracks direct from the crushers, without the rock going into storage. The total equipment for the rock crushing plant consists of: 1 screen A, 72 in. diam. by 22 ft. long; 2 screens E, F, 60 in. diam. by 24 ft.; 3 screens B, C, D, 48 in. by 10 to 12 ft.; 1 Bacon, 24 by 26 in. jaw-crusher; 3 Bacon 36 by 10 in. jaw-crushers; 2 Allis-Chalmers 40 by 20 in. corrugated rolls; 1 Allis-Chalmers 40 by 15 in.

smooth roll; 30 Robins Conveying Belt Co.'s conveyors having a total length of 4152 ft.; four electric motors, 50 hp.; one 75 hp.; five 100 hp., and two 150 horse-power.

A main motor-house, 24 ft. wide by 60 ft. long, with timber framing, and covered on the outside with No. 24 corrugated iron, is erected to house the main motor and equipment. The pilot house, 24 ft. square, is mounted on the roof of this motor-house, giving the operator a clear view of the entire plant. All electric motors for the plant are controlled from this pilot house.

The switch-board and controllers are a new and novel combination, designed especially to meet the requirements of this plant. A separate and different colored light is installed directly over each controlling switch, and a duplicate light and auxiliary switch is placed close to each electric motor controlled from the pilot-house. Each motor has a push-button and an electric bell near the auxiliary controlling switch. Each motor is designated by a certain number of rings on the bell. In case any part of the plant gets out of order, the man in charge of that particular part of the plant signals to the operator



Character of Ground Before Dredging. Dredge-Tailing in Distance.

in the pilot-house, who immediately closes down all or any part of the machinery affected by the breakdown, and at the same time telephones to the foreman of the repair-gang, who is in the repair house, telling him exactly where to go to find the trouble, thereby avoiding waste of time. All the electric wires to the different motors from the pilot-house are laid in underground conduits, therefore there are no exposed wires around the crusher-plant to endanger the lives of the operators. Electric power is delivered to the crusher plant at 60,000 volts, and is transformed down to 2300 volts, and distributed to all motors at 2300 volts. The transformers are in a concrete tank, installed below the ground-line, and completely covered. The transformers below the ground-line and the concrete tank being provided with drains to carry any waste oil away to the river, lessens the possibility of fires from this source.

A hand-operated overhead crane, having a lifting capacity of 10 tons, a span of 40 ft., and 30 ft. clear head-room, is installed upon a timber-structure 100 ft. long, placed over the crusher machinery, and extending up to the repair-house, where all supply and extra parts are stored. The repair-house is 24 ft.

wide by 48 ft. long, and is equipped with a complete set of tools and machinery to carry out necessary repairs to the plant.

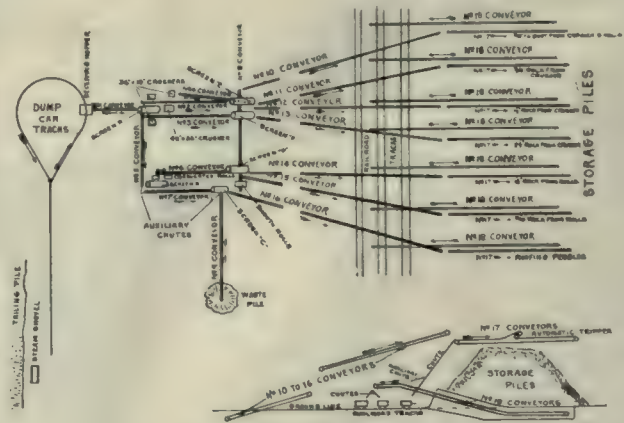
Two steel tanks, 11 ft. 6 in. diam. by 10 ft. deep, are mounted on a timber super-structure 20 ft. above the ground, and are placed midway between the railroad tracks and the steam-shovel site. The oil-pump is near the railroad track, and delivers the oil from the railroad cars into the storage-tanks. The pipe-



Dredged Ground After Leveling Tailing and Planting Eucalyptus.

line from the storage-tanks is laid underground and is provided with ground-cocks spaced every 80 ft. up to the shovel-site, to supply fuel-oil to the dinky-engine and steam-shovel.

Two steel-tanks, each 11 ft. 6 in. diam. by 10 ft. deep, are mounted on a timber super-structure 30 ft. above the ground, and near the crusher-site, to supply water to the shovel and railroad engines, and also for fire purposes to the entire plant. The water is delivered to the tanks by one 8-in. centrifugal pump direct-connected to a 50-hp. motor. A most complete pipe-line for fire purposes has been installed, amply supplied with hydrants and fire-hose, placed in convenient positions around the crusher-plant. A Fairbanks iron-framed railroad track-scale,



Flow-Sheet of Crushing Plant.

with 50-ft. platform, and a capacity of 200,000 lb., is installed in a convenient position along the spur-track leading to and from the storage-piles, to weigh the cars of crushed rock being shipped.

The plant is operated with the following labor: superintendent, steam-shovel engineer, steam-shovel engineer helper, locomotive engineer, gravel train brakeman, two laborers moving tracks of shovel ahead, two laborers unloading cars at dump or receiving hopper, one laborer regulating the receiving-

hopper door feeding the rock to No. 1 conveyor, four laborers attending the four crushers and two rolls, three laborers attending to loading of cars at storage-piles, two laborers placing side-boards on railroad cars, two laborers oiling conveyors and countershafts, one main operator in the pilot-house, one electrician for motors, one mechanic in repair-house.

The steam-shovel takes 8 minutes to load a train of 7 cars of 4-cu. yd. capacity. The dinky-engine hauls the train of cars to the dump-hopper, and returns the empties to the shovel in 7 minutes. It takes 10 minutes to load a 40-ton railroad car at the storage-piles, and two cars can be filled at the same time with the same size of rock. There are 7 separate piles of different sizes of rock. Therefore, it is possible to load 12 cars per hour, making a shipping capacity of each size of rock of 480 tons per hour, to fill a rush order for rock providing the cars are at hand.

The crushed rock is unsurpassed for concrete, asphalt macadam, and macadam roads. It also binds perfectly with crude asphaltic oil. The crushed rock weighs as follows: $2\frac{1}{2}$ in. size, 2592 lb. per cu. yd.; $1\frac{1}{2}$ in., 2580; $\frac{3}{4}$ in., 2330, and from $\frac{3}{8}$ in. to dust, 2400.

A test upon the quality of this rock, made by Smith, Emery & Co., of San Francisco, credits the material as being mainly basalt, specific gravity, 2.94, hardness 5, absorption 0.01, and voids 50 per cent.

In the rattler-test a charge of 100 lb. dry rock, at a speed of 28 rev. per min., in 5040 revolutions was reduced to 90 lb., showing loss by abrasion of 10%. Of the dust from the 'rattler', the amount retained on 4-mesh was 2%, on 10-mesh 0.5, and fine 7.5 per cent.

The commercial value of monazite depends upon the incandescent properties of the rare earth oxides which it contains, such as cerium, lanthanum, didymium, and thorium oxides, which are used in the manufacture of the Welsbach and other incandescent gas-light mantles. It is the thoria that is used in largest amount and which gives the actual value to the monazite. In the reduction of the monazite sand there are a number of rare earth salts that are obtained in considerable quantity, which has made it possible to carry on an extensive series of experiments with these rare earth oxides. It requires from four to six months to recover from the monazite sand its content of thoria and render it sufficiently pure to be used in the mantles.

Sludge is soft water-soaked mud or mire. The term is applied to muddy or pasty refuse of various kinds, such as escapes from coal washeries. In metal mining it refers to the mixture of fine rock powder and water resulting from the action of a drill in boring. It is also used to denote the tailing escaping from buddles, vanners, and other concentrating machines for handling fine material. For this, slime is also used, but in modern practice the latter term has come to mean a finely ground ore worthy of further treatment, and does not generally signify a waste product, as does sludge. In petroleum refining sludge is used to designate the refuse acid and alkali solutions coming from the agitators.

DRILLING FOR OIL IN EASTERN ILLINOIS.

Written for the MINING AND SCIENTIFIC PRESS
By R. S. BLATCHLEY.

The successful and phenomenal growth of the Illinois fields within the last four years may be attributed in large part to the careful study of conditions on the part of the operators. The rapidity of the extension of the field is remarkable when it is noted that 95% of the bores within the field were successful and only 5% were dry. As drilling advanced southward from Casey and Westfield into deeper fields around Robinson and still deeper territory around Bridgeport, new tactics had to be used. The advance was not indiscriminate, but was cautious though continuous. Limits were determined by the bringing in of a dry hole that either failed to show the sands or yielded salt water. Such a hole meant a shifting of development inward. The early drilling indicated a southward trend to the field and the movement of drills continued in that direction. As the field stands today, with its few failures as compared to the general success, one cannot help but feel that Illinois has added its share to the fund of knowledge of oil development as well as to production.

There are many different steps necessary to the successful development of oil properties, and the novice will find himself confronted continually by perplexing problems. He often fails, while the experienced man is able to meet conditions. The first step is to locate properties as near as possible to producing wells. The old operator watches the growth of the field from the first news of striking oil and makes his locations, provided he has the necessary leases, only when he feels that they are within the limits of known productive territory. The uninited more often is attracted to outside territory and his bore is strictly a 'wild-cat' proposition. Any observer of the oil business will soon note that the larger companies and operators do but little wild-cattling and profit by the experience of these small operators. It is true, however, that field limits are only established by these test bores.

There is no set rule concerning leasing, as it necessarily is dependent upon conditions. In most cases properties are leased, usually for a period of five years with options of further lease, and as much longer as production continues. If when leasing, the adjoining territory is untested, the farmer usually receives from one-eighth to one-sixth royalty on the future production, with the further stipulation that drilling is to begin within one or two years, or that a stated rental per acre be paid until the first well is drilled. In case the land-owner has property near proved territory, it naturally takes on added value and a bonus is demanded. The closer he is to good oil properties, the higher the bonus that is demanded, often reaching as high as \$200 to \$300 per acre. The average bonus in Illinois on land adjoining good oil properties, ranges from \$30 to \$100. The land-owner retains all rights over the surface of the land with the exception of the portion necessarily used by the oil operator for his wells, power-house, boiler-house, tankage, and waste-pit. Upon an 80-acre tract not more than six acres are necessary for

this, even though a full quota of wells be put down. In an industrious community the farmer tills his land at the same time that he derives income from oil. Stipulations are generally made regarding the use of gas by the land-owner and of payment per year from the sale of gas from gas wells. This generally averages from \$100 to \$125 per well. Also it is usually agreed not to drill wells closer than 200 ft. to any dwelling or barn, except in the cases of town lots. It is further agreed that the lessee shall be responsible for all damages caused to growing crops and usually that all pipe-lines must be buried below plow depth. If, on the area leased, some good wells are developed, the lease, like the franchise of a street railway, becomes the most valuable part of the prop-

the lease under consideration were 40 acres and had 8 line wells, each producing approximately 10 bbl. per day from the same sand, the total estimated production for that lease would be 96,000 bbl. At the value of 60c. per barrel, the lease is worth \$57,000, or in the terms of a bargain \$50,000. If the estimates were carried further, a 10-bbl. well in a 15-ft. sand would roughly yield 3000 bbl. during its life. These estimates are considered further in relation to the depth of the sand and to the daily production, that of 15, 20, 25, 30-bbl. wells producing in 5, 10, 15, 20, 25, 30, 35-ft. sands. The figures quoted are based merely upon business judgment and are not worked out on a scientific basis. As a matter of fact, the basis is low and the yield will usually amount to much more.

John F. Carll, in Report III (Second Geol. Surv., Pennsylvania), on 'Progress of Oil Regions', gives the following estimates in support of his statement that an oil sand contains from one-tenth to one-eighth of its bulk in oil. These estimates can be applied generally to the sands of the Robinson fields, although they originally had reference to the Venango group of sands in Pennsylvania:

SUPERFICIAL QUANTITIES.
43,560 sq. ft. in an acre.
27,878,400 sq. ft. in a sq. mi.
6,272,640 sq. in. in an acre.
4,014,489,600 sq. in. in a sq. mi.

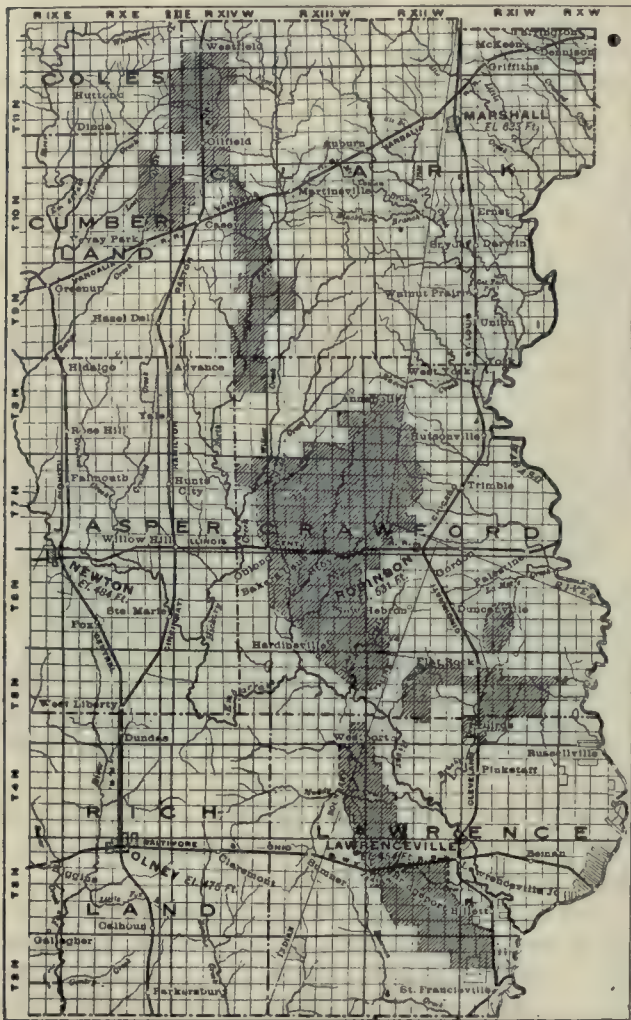
CUBICAL QUANTITIES.
9,702 cu. in. in a bbl. of 42 gal.
5.6146 cu. ft. " " " "

PRODUCTION OF OIL PER ACRE.
646.53 bbl. if the sheet of oil be 1 in. deep.
1293.06 " " " " 2 " "
1939.59 " " " " 3 " "
4997.68 " " " " 7.73 " "

PRODUCTION OF OIL PER SQUARE MILE.
414,779.65 bbl. if the sheet of oil be 1 in. deep.
827,559.30 " " " " 2 " "
1,241,338.95 " " " " 3 " "
3,198,515.20 " " " " 7.73 " "

On this basis 15 ft. of good oil-bearing sand would have a producing capacity of 15,000 bbl. of oil per acre or 9,600,000 bbl. per square mile.

With the lease secured, the operator must choose the site for his first well. It is the custom to place wells about 200 ft. in from a property line. This varies, however, with different depths of sands. In the shallow Casey pools of a depth of about 450 ft., instances are known of wells being put down 100 ft. in from the property lines. In the Robinson or Crawford county fields, where the sands are about 950 ft. deep, the location line is 200 ft. in, while in the Lawrence county field, having the sands at a depth of 1300 to 1800 ft. deep, the lines are 250 to 300 ft. in. In the Casey pool and Crawford county pool, wells are usually put down 450 ft. apart, while in Lawrence county where the wells are pumped from the Buchanan, Kirkwood, and Tracy sands, the locations are 660 ft. apart. Certain circumstances govern the placing of wells aside from mere distance. If there is a sudden dip of the sand around a regular location, the well is shifted to meet the conditions as judged by the operator. He considers also permanent power-houses, irregularities of surface,



Oil Pools in Eastern Illinois.

erty, and with wells in operation is often sold for a large amount. A transfer often takes place even though there are no wells drilled on a leased farm. The chance of this is dependent upon the distance from good territory. The sale of oil properties is often made by payment of a lump sum without estimates of future production, but more often the price is gauged by an estimate of the quantity of oil per acre per well. This in turn is dependent upon the thickness of the sand and the daily production of the well. For example, it is roughly estimated in the Illinois field that a well producing 10 bbl. per day from 10 ft. of sand will yield 2000 bbl. per acre. It generally, under these conditions, draws oil from six acres, and consequently would yield 12,000 bbl. If

and buildings, in his choice of a well-site. Again an operator will put down wells that are based upon the relative production of neighboring wells. An unwritten law exists that a lessee shall drill whenever producing wells are found on adjoining properties. This is called 'offsetting', and is done to protect property lines and drainage of oil from the lease. Should there be wells completely surrounding the tract, the best plan is to offset all adjoining wells and only drill along property lines, leaving the

dependent upon the locality and depth of sand to be reached. The contract stipulates for drilling a certain number of feet and the contractor is responsible for the well to the extent of reaching the sand and determining whether it is producing. The operator, on his part, usually agrees to furnish all conductor, drive-pipe, casing, tubing, and rodding, and is to secure and pay for the teaming in the transportation of the pipe. The contractor is held responsible for the purchase and construction of the rig. He furnishes his power, boiler, and 'string of tools'. He contracts and pays for all fuel and water used. He employs the drillers and tool dressers and is held responsible for all accidents. He also must clean out the well, put it in order, and pull the casing after a successful shot. It is furthermore generally agreed that drilling shall begin within a certain time from the date of the contract.

With the contract signed, the operations pass into the hands of the contractor, who in turn contracts with the 'rig-builder' or man who constructs the rig.

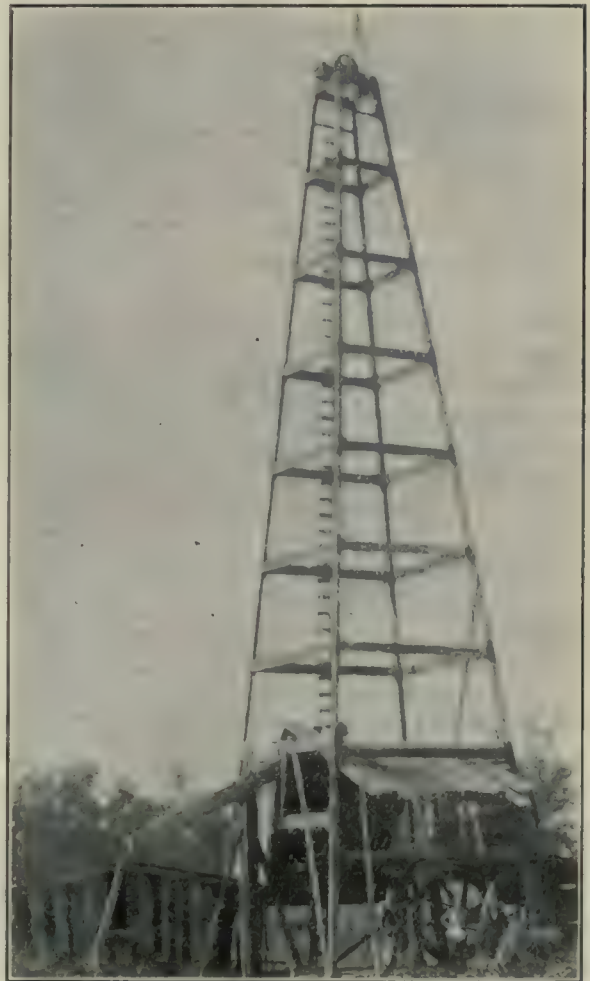


Drilling With a Mast.

centre to draw upon. It has been found that there is no necessity for putting in centre wells, as the line-wells draw longer and to much more advantage. Moreover, it is an unnecessary expense to put in an extra well in a forty-acre tract or three extra wells in an eighty-acre tract.

It is a difficult matter to estimate the acreage drawn upon by oil wells. This is dependent upon the depth and porosity of the sand, the area of the pool, and other factors. In the Casey pool in the northern end of the field about eight acres are assigned to each well. In the Crawford county pools, six acres are considered an oil unit, while in Lawrence county, where the locations of the wells pumping from the deep sands are farther apart and the sands are more prolific, ten acres is the area drawn upon. In the Casey and Crawford county pools twelve to fourteen wells are drilled on an eighty-acre tract, while in the Lawrence county field eight to ten wells are drilled to every eighty acres. These figures take no account of centre wells.

The next step, after choosing and marking a location, is to contract for the drilling. An agreement is drawn up between the operator and the contractor calling for the drilling at a certain price per foot.



Standard Rig as Used in Illinois.

Practically all rigs in the Illinois fields, outside of the Casey field, are of the Standard type and consist of four strong uprights, held in position by ties and braces. They rest on strong wooden sills, which are preferred to masonry. The derrick is used as a support for the sheave called the crown pulley, which must be at a sufficient height to swing the long heavy drilling tools free from the ground. The average height of the derrick is 66 ft. for the shallow fields

and 72 ft. for the deeper fields. Oil derricks are of a peculiar type and are conspicuous features of the landscape. In the shallow fields a combined portable rig and drilling outfit is used. These machines are of two types, the Star and the Parkersburg. Their cost for all equipment necessary to drilling is about \$2300. They are not, as a rule, entirely practicable in the deeper territory, and where hard materials are found at depth. With the standard derrick are included under the term 'rig' all the woodwork and necessary iron fittings, so arranged and put together that when boiler and engine are in place, drilling can be begun at once. Other important features of the derrick are the bull-wheel and shaft on which the cable supporting the drilling tools is wound, the walking beam, to give vertical motion to the tools, and the band-wheels for transmitting power from the engine to the movable parts. These parts of the equipment are covered with sheds for protection from the weather.

The construction of the rig requires about three days. In the Illinois fields the price paid for the rig complete and new is \$500. After the well is completed the structure is, in most cases, torn down and re-used. The cost of tearing down and re-building is about \$60. It costs the contractor about \$40 additional for new lumber, nails, repairs, etc.; thus placing the total cost for its second or third use at about \$100. It is estimated that the original derrick can be used ten or twelve times. In case a well must be cleaned out, a light portable rig for this purpose is used.

In 1906, during the opening of the field at Casey, the cost of drilling was \$1 per foot, when fuel or water were not included, and 90c. per foot when they were. Since that time the extension of drilling into deeper sands has changed conditions. The following costs are now representative:

| | Cost per foot. |
|---|----------------|
| Casey sands, 450 ft. deep..... | \$0.80 |
| Crawford county, 900 to 1000 ft. deep, in 1907.... | 1.00 |
| " " " " " " 1908.... | 0.90 |
| " " " " " " 1909.... | 0.80 |
| Lawrence county: | |
| Bridgeport sand, 950 ft., with 10-in. drive-pipe and 6¼-in. casing..... | 0.90 |
| Bridgeport sand, with 16-in. drive-pipe and 8¼-in. casing | 1.35 |
| Buchanan sand, 1350 ft. deep..... | 1.35 |
| Kirkwood sand, 1500 ft. deep..... | 1.50 |
| Tracy sand, 1700 ft. deep..... | 1.50 |

The Bridgeport sand was the first one developed in Lawrence county and was drilled by the methods used for reaching the Crawford county sands of the same depth. Later when the deeper sands were discovered and found to be more prolific, it was learned that bores could not be put down to advantage to the lower sands through a 6¼-in. casing. To secure production from all sands, therefore, a larger size drive-pipe and 8¼-in. casing were introduced. This is the almost exclusive practice today for new wells. Where old wells with smaller casing are already down to the upper sands and companies wish to extend them to the lower sands, new holes are drilled. This is frequent north of Bridgeport. South of the town the wells are mainly new and one set of casing does for all sands.

In work in this territory the drilling crew consists of four men, two drillers and two tool dressers, who work in pairs and in shifts of twelve hours each. It is the duty of the driller to stay close to the mouth of the bore, turning the cable and the temper screw when necessary. He controls the machinery by cords or by levers when changing the tools and in sand pumping. The tool dresser helps the driller. He fires the boiler, attends to the engine and machinery, and dresses or sharpens the bits as each in turn becomes worn. Drillers in the Illinois field in 1909 were paid \$5 per day and tool dressers \$4. The time required in the different pools for drilling, shooting, cleaning, and putting a well in order, is as follows:

| Pool. | Days. |
|------------------|----------|
| Casey | 4 to 5 |
| Robinson | 14 to 15 |
| Bridgeport | 14 to 16 |
| Buchanan | 30 |
| Kirkwood | 45 |
| Tracy | 55 |

As soon as the oil-bearing stratum has been tapped and a reasonably fair production has been determined by the use of a bailer, the work is continued into the sand to within a foot or two of the bottom or until evidence of salt water appears. The well is then torpedoed or shot with nitro-glycerine, in order to make open fissures in hard rock and to form a cavity in softer sand, into which the oil may seep or flow. The shooting is gauged so as to form a hole within the oil-bearing sand and not disturb the overlying formations, usually shales. If these be loosened, they fill the cavity with debris and makes the work of 'cleaning out' exceedingly difficult. The size of the shot is dependent upon the texture of the rock and the thickness of the sand. In Clark and Crawford counties the sands are shot within 3 ft. of the top, while in Lawrence county the deeper sands are torpedoed within 5 to 10 ft. of the top. In the former counties a 5½-in. shell 5 ft. long, holding 20 quarts of explosive is used. In the deeper fields the same shot is used in the oil-sand proper, but in the bottom of the sands, 1½-in. shells are used in multiple as an anchor. These are loaded and placed around the hole at the base of the sand. At intervals of 10 to 15 ft., one of them is loaded with explosive in order to insure an even transmission of the force. The use of the thin shell is to protect the upper sand from as much debris as possible and to insure a safe explosion in the sand. The average shot for the whole Illinois field is from 80 to 100 quarts. This has been found adequate for all sands. The old custom based on the rule 'the larger the shot, the better the well', has been discarded as extravagant, and large shots are now only used in cases of hard sands or exceptional depths of pay-sand. The shooting is done by agents of the manufacturers of the explosive, who are employed at a salary, approximately \$100 to \$115 per month. In Clark and Crawford counties, the shooter is responsible for the well from the moment he takes charge of it. If through neglect or carelessness a premature shot occurs and ruins the well, the shooting company must immediately arrange to drill another on the same location. If the shot is successful the contractor resumes charge of the well and completes it by cleaning out and putting it in order. The

conditions are different in Lawrence county, where trouble is experienced by the disposition of the formations immediately above the oil-sands to cave. The oil company and the shooter work together and a shot is lowered with the utmost care. Often a cave-in of the shale happens before the shot is exploded, and in that case the company cleans out the hole very cautiously to the top of the shot. As in the northern end of the field, the explosive manufacturers are responsible for loss by a premature shot caused by neglect, but not for loss due to such a cave.

The torpedo companies have local plants for the manufacture of nitro-glycerine. These are situated in isolated spots near the field, one for each general pool. At other out-of-the-way places in the field there are maintained small storage houses. From these points the nitro-glycerine is hauled overland by the 'shooters' in light wagons, fitted with strong but flexible springs. The wagon-bed is arranged with square padded cells for holding ten-quart cans. Upon the outside of each wagon there is printed in large letters 'Nitro-glycerine, dangerous'. The approach of a glycerine wagon upon the highways is a signal for apprehension to most travelers, who are generally surprised to note that the driver trots by without the slightest concern for bumps in the road. As a matter of fact there is little danger when the outfit is in charge of a careful man acquainted with the nature of the thick whitish liquid. The writer has frequently ridden on the 'dangerous' wagon, only to find all apprehension quickly dispelled in admiration of its easy riding. Accidents are rare and are due to a collision of some kind or to carelessness in pouring the liquid into the cans. If a drop or two is allowed to get on the outside of the can, it gives opportunity for explosion through friction. The liquid is very viscous and is easily poured by a steady hand.

When a well is ready to be shot, the contractor notifies the oil company and the 'shooter'. When the latter arrives, the hole is measured to the sands with a steel tape. The measurement must be accurate within the half of a foot. The glycerine is then poured into the shells and each is lowered to the right distance. Each shell is conical at the lower end and concave at the upper, so that a series fits snugly together. While being lowered the shells are attached to a thick cord with a special releasing device. The last shell has on top a waterproof percussion cap, connected with a wire by which it can be set off with an electric spark. This is operated by a hand battery. It is the custom in the Illinois field, after the shot is set, to raise the casing considerably above the sand. This takes but an hour or two and eliminates any danger of collapsing or breaking the casing while in the hole.

When the explosion takes place, a person 100 yd. away will, after an interval of 30 to 40 seconds, feel a quick jar of the earth. This is followed by a muffled report which seems to come from any place other than below. After about a minute and a half a roar is heard from the direction of the well and gas can be seen pouring out, followed shortly by a column of oil and water. This begins to rise slowly and eventually reaches above the top of the derrick,

where it sprays out in the direction in which the wind is blowing. At the same time there is heard a rattling of pebbles and pieces of rock and slate against the derrick supports. For a moment or so dull thuds may be heard as rock fragments fall to the ground. The column of oil subsides in the course of several minutes until within a few feet of the top of the casing, where it pours out in a steady stream. If the well is a 'gusher' it will flow for several hours or until the drillers are able to cap it in. When the well has settled the drillers begin to re-set the casing and make preparation to clean the bottom preparatory to pumping.

There are two kinds of nitro-glycerine used in the field, the liquid and the solid. The latter is made into cylindrical forms and has the appearance of a yellowish transparent jelly. It has the consistence of rubber and can be readily handled without danger. There is some difference of opinion as to its efficiency compared with the liquid explosive. The Ohio Oil Co. has given it a thorough test and has found it wanting in explosive power. The advantage over the liquid is that it is easily transported and placed in a well. The E. I. Du Pont de Nemours Powder Co. is the most prominent one operating in the Illinois field, and its prices are considered the standard. These in 1909 were as follows:

| | |
|------------------------------------|---------|
| 10 quarts | \$25.00 |
| 20 quarts | 40.00 |
| 30 quarts | 47.50 |
| 40 quarts | 55.00 |
| 60 quarts and over, per quart..... | 1.15 |

Two cents per foot is charged for electric wiring. In case trouble is experienced in shooting and the shooter is detained, an extra charge of \$15 per day is made after the first day.

FREEZING METHOD FOR RESTRAINING MINE-WATERS.

Written for the MINING AND SCIENTIFIC PRESS
By EDWARD H. NUTTER.

A novel method for taking care of a large flow of water underground was devised and carried out at the Bessie mine on the third beach-line near Nome, during the past summer. It consisted of freezing off the end of the drift in which a stream of water had been struck when beginning work in the spring, and that had flooded the workings and drowned the mine. The idea occurred to John Brower, of Nome, to use refrigeration. He took a contract for doing the work. A line of holes was drilled down from the surface, and across the drift, with a Keystone drill. Pipes were let down these holes into the drift, and connected at the top with an ammonia machine. Sand was then shoveled into the drift through the holes, and freezing commenced. This was kept up until the latter part of August when the job was completed. A solid block of sand and ice was thus formed, connecting on all sides with unthawed ground, which completely dammed the drift and shut off the water from the rest of the mine. When this was done, the mine was unwatered and driving operations were resumed. The drilling and freezing required about a month and cost \$4000.

THE FOREST SERVICE AND MINING IN THE NATIONAL FORESTS.

By W. W. DYAR.

*From the inception of the policy of reserving certain of the public lands of the West for forestry purposes, it was realized that these lands must remain open to mineral exploration and development. The mining camps were largely situated in those elevated and timbered regions which would necessarily be devoted to forestry purposes. To withdraw these lands from the operation of the mining laws would be to take away the means of livelihood of a large part of the population, and to limit the production of those metals peculiarly essential to the prosperity of trade and commerce. Accordingly in the Act of June 4, 1897, Congress made an explicit declaration that the mineral lands within the Forest Reserves should remain open to mineral exploration and entry. This same Act provided for the creation of a field force, to protect, administer, and regulate the use of the Forest Reserves. When this force took active charge and began to make timber sales and issue grazing and other special use permits, it was soon confronted with many difficult and embarrassing questions in the mining regions. It found much of the land plastered over with unpatented mining locations, some in course of active development, others only occasionally worked, and many apparently abandoned. The proclamations creating the Reserves excepted therefrom 'all valid claims'. The land covered by invalid claims therefore became a part of the Forest Reserves. In order to know what lands were subject to the jurisdiction and control of the Forest officers it became important to find out what claims were valid and what invalid. Now, it happens to be the nature of mining claims not ordinarily to carry upon their face any unmistakable marks showing which are valid and which are invalid. It is not easy to separate the sheep from the goats.

The question of the validity of a mining claim under our law ultimately depends, of course, upon the question of a discovery of mineral within the meaning of the law. The difficulty of determining this question and the danger of attempting to pass upon it in the early stages of development was doubtless recognized by those then charged with the administration of the Forest Reserves; but, perhaps, the difficulty was not fully appreciated. At any rate a policy was entered upon of trying to distinguish the valid from the invalid claims, when application was made for patent and the land was about to pass definitely and for all time out of the power of the Government to control it for Forestry purposes. Then an examination was made by a Forest officer and a report rendered which laid the foundation for proceedings in the General Land Office to determine whether a discovery of mineral had been made and the requirements of the law complied with so as to entitle the claimant to a patent. A little later, when it became known that large bodies of apparently non-mineral lands within the Forest Reserves had

been located as mining claims and were held and used, not for mining, but to control timber, water-power sites, and other surface uses, a further step was taken. Investigations were made and, in co-operation with the Interior Department, proceedings were instituted to have such claims declared invalid prior to application for patent. Proceedings of this character, however, have generally been limited to cases of apparently glaring fraud, or cases in which the existence of the invalid claims worked some special injury to the Forest Reserves. The execution of the policy of examining and reporting on mining claims was for a time necessarily left to the local Forest officers—primarily to rangers, who it must be admitted, were not specially qualified for this particular work. No doubt they did the best they could. They manfully tackled the job; in some regions with great vigor, in others with more caution and discretion. The result on the whole was that this business quickly grew to proportions not originally contemplated. Once the machinery was set in motion it produced a grist of controversies irritating to the miners and prospectors and embarrassing to the Forest Service. It became evident that measures must be taken to limit the scope of these examinations and to have them made by men especially qualified for the work.

The spirit in which the Washington office was dealing with these questions is shown by the following quotation from a letter written on January 16 of the present year to one of the District Foresters: "It is our feeling here that the Forest Service must steer a judicious middle course. On the one hand, Forest officers must not permit an excess of zeal to make them seem hostile to bona fide claimants. On the other hand, they must not be over cautious in dealing with claimants who are not entitled to their claims. Sometimes we shall lose cases because of methods of practice or interpretation of the law by the Land Office which cause us to fail to establish a point rightly taken. We have got to work, of course, for the establishment of right principles, whether we lose or not. Yet we must face the fact that when we lose many cases there is not much for us to do but say we were wrong. We cannot explain the situation on the ground that somebody else was wrong." Since that letter was written we have lost many cases—a good many cases. Like the writer of that letter, however, I am not disposed to quarrel with the decisions of the Land Office in these cases. The Registers and Receivers it is true are appointive and not elective officers. They, like other judges, may sometimes mistake the law or misinterpret the facts. But they are residents of the locality in which the controversies arise. They are in touch with the local needs and local sentiment, and their views and decisions form a wholesome corrective to that tendency toward bureaucratic methods inseparable from the conduct of the great Department at Washington.

A few days after the letter just referred to was written, and in answer to a letter and memorandum from one of the District Foresters discussing the mining conditions, the Washington office had this to say: "The memorandum appears to argue that the mining law should be strictly enforced regardless of the character of the land, but in your summary it is

*Abstract of address delivered before the American Mining Congress at Goldfield, Nevada.

recommended that a more liberal policy be adopted in regard to contesting claims on the ground of insufficient discovery when the good faith of the claimant is apparent, and there is no doubt but that the land is being taken solely for its mining values. It appears to me that we can safely go a little farther than this and not contest mining claims the patenting of which would not in any way jeopardize the interests of the National Forests. It would appear that * * * we need only concern ourselves to the extent of contesting claims which we believe are being taken for purposes other than mining, and the patenting of which would interfere with the interests of the National Forests." So you can see that the Forest Service was not at that time, as many persons seem to believe, trying to invent new methods of interfering with mining and of preventing the patenting of mining claims; but on the contrary was seeking to limit its activities so as to disturb the mining interests as little as seemed possible, consistent with the great purposes of conserving the forests, and protecting the watersheds.

In the meantime the Forestry Committee of the American Mining Congress had taken up with the Forester this and other questions affecting the mining interests. The result of the interviews, resolutions, and correspondence between them has been recited in the report of that committee. The rule, which the Forester agreed with the committee to adopt, read as follows: "Mining claims in any National Forest apparently held in good faith for mining purposes will not be further examined unless the passage thereof to patent would be prejudicial to the Government if the said claims should in fact be found to be invalid. If any such claim is apparently not held in good faith for mining purposes, it will be examined by a qualified mining expert to ascertain the true conditions, and the report of such mining expert will be submitted to the Department of the Interior for its consideration." This rule was accordingly promulgated, but with a further modification by which the words "prejudicial to the interests of the Government" were changed to "prejudicial to the interests of the National Forests." In other words, the Forest Service very properly concluded that any interests of the Government other than those of the National Forests should be left to the Interior Department.

Since the adoption of this rule we have been trying to get it into speedy operation in the field. We have had some difficulty in making some of the field officers realize its full meaning. And, unfortunately, we have on hand a heritage of cases coming from the earlier times when the policy had not been clearly defined. The Service fully realizes that many of these cases were originated by it on insufficient grounds, without sufficient knowledge of the facts, and in some cases where it believes its attitude was right, it cannot produce sufficient evidence to sustain its position. From all such cases we are now retiring as fast as possible; and in making that retreat we are not taking particular pains to preserve our dignity. To hold on firmly to the things that are right, it is good to let go quickly of the things found to be wrong. You perceive that I am not averse to

making admissions. But I was not a member of the Forest Service at the time most of these things were done; and as you doubtless know, it is comparatively easy to acknowledge the mistakes of other people.

About the middle of June last, in a further attempt to adjust the relations of the Forest Service and the mining interests on a more satisfactory basis, I was directed by the Forester to visit, as far as seemed necessary, the mining camps situated in various National Forests, investigate the conditions, find out what we were doing that was wrong, or that worked injustice to the miners, and to suggest remedies if possible. In the performance of the task entrusted to me I visited most of the mining camps and mining centres of Colorado; some of those in Utah, California, Oregon, Idaho, and Montana, stopping finally in the Black Hills of South Dakota. I talked with prospectors, mine owners, mining engineers, mineral surveyors, mining lawyers, and, of course, with some Forest officers. I tried, to the best of my ability, to get at the actual facts. I was, and am, a firm believer in the general policy of forest conservation, but I had not been identified with the Forest Service long enough to become wedded to any particular measures of administration. In the course of this investigation I met with some surprises and formed some pretty definite conclusions, and in the interest of a better understanding I am going to tell you frankly what some of them were. "In the first place, I did not find a single miner who had ever been prevented from prospecting freely on the National Forests, or who knew of anybody else who had. I did find in the towns somewhat removed from the mining regions, persons who seemed to believe that prospecting had often been stopped and that the Forest Service didn't want it to be free. And only four days ago I met on the train the editor of a mining paper, who, I believe, honestly thought that this was true. In the second place, I found that in some localities, and at various times in most localities, the Forest Service had, as it seemed to me, made a fundamental mistake in the matter of examining mining claims when patent is applied for. With the best of intentions, no doubt, some Forest officers seem to have assumed that the validity of all mining claims was fairly open to question and that all alike must be examined impartially to determine whether there had been a discovery of mineral and whether the requisite amount of development work had been done. The principle involved had not seemed quite so clear when the protests and complaints came up separately to the Washington office, but on the ground and in contact with actual conditions it became clear to me that the course pursued ignored a fundamental principle that always ought to be observed by a government in dealing with its citizens: namely, that until some fact or circumstance appears tending to show the contrary, it should always be presumed that the acts of all citizens are done in good faith with intent to observe the law. As one group of miners put it to me, "The Forest Service assumes that we are all timber thieves and calls upon us to prove that we are honest miners and law-abiding citizens." Now, I am glad to say that never was the general attitude of the Service as a whole. It is not

now the attitude I am sure of any part of it, or in any locality. It may be that recent instructions have not yet been fully brought home to every Forest officer, but they soon will be. Every effort will be made to limit the examinations for discovery to cases in which there is some reason to think that the claimant is using the mining laws illegitimately to get title to timber lands, to ground controlling a water-power, or some other surface right or advantage tending to defeat those purposes for which the National Forests were established. Examinations of claims above timber line, or on barren ground, where no such surface rights can possibly be obtained, should, of course, never be made.

In the third place, I became convinced that, largely because of the mistaken attitude just mentioned, partly because of occasional arbitrary acts of individual officers, partly because of petty annoyance arising from a too strict construction of regulations by other officers, mining had in fact been hampered to some extent and in some localities; and to a greater extent had been discouraged by the false impressions thereby created as to the general purposes of the Forest Service. Measures have been taken, and still others will be taken, to remove these causes of trouble. In spite of all that has been said, the Forest Service realizes that the development of mines is just as important a policy as the conservation of timber and the protection of the watersheds. The two things must go hand in hand; and a plan must be perfected by which mining and forestry can be carried on in the same territory with the least possible friction and the greatest mutual helpfulness. We are not in love with this business of examining mining claims. It is not a weapon of precision. When we train it on the mob pillaging the store we are in danger of hitting a law-abiding citizen working quietly in the neighboring shop. But it is the only weapon we have as the law now stands; and let no one infer from anything I have said that we will hesitate to use it whenever we have grounds to suspect that the mining laws are being wrongfully used to get timber lands out of the National Forests, or to acquire title to lands controlling a water-power, and by that means, subject to a private monopoly that which both nature and the policy of the Government have devoted to the general good. There will be no going backward in these respects.

I said a few minutes ago that the practice of forestry and the development of the mines on the public domain were equally important to the country at large. I want to add that they are deemed equally important by the laws of the United States now in force. But there is no use shutting our eyes to the fact that they do interfere to some extent with each other, and that to some extent each must give way to the other. If a mining claim located in the midst of a valuable body of timber does in fact show a valid discovery of mineral and full compliance with the mining law in other respects, then the Forest Service should not and cannot legally make any objection to the issuance of a patent. But the issuance of that patent does in fact take away some of the lands of the National Forests which are valuable for forestry purposes. On the other hand, I think it just

as clearly the law that by the creation of National Forests the miner has lost the right to go upon the public mineral lands included therein, and freely take timber for mining purposes. This right he formerly had under the Act of Congress of June 3, 1878, but when the lands were withdrawn and made a part of a National Forest he lost that right. And to that extent mining has had to give way to forestry.

Now I am perfectly aware that the report of the Committee of Forestry here today takes an opposite view. The Committee says that it is unable to find any Act of Congress repealing the law of 1878. There is none. Neither is there any Act repealing the Homestead Laws, the Timber and Stone Act, or the Desert Land Act. Yet nobody contends that these statutes are still in force within the National Forests. The truth is that the same thing happened to the Act of 1878 as happened to the laws last mentioned. None of them were repealed, but they all ceased to operate upon the National Forest lands as soon as the lands were reserved, because their continued operation upon those lands would have defeated the very purposes for which Congress authorized the reservations to be made. I want to call your attention to the fact that this law of 1878 is not a part of the mining laws. It is not distinctively a mining law at all. Mining is only one of several purposes mentioned in it. The material parts of it read as follows: "All citizens of the United States and other bona fide residents" of certain States and Territories named in the Act "shall be, and are hereby, authorized and permitted to fell and remove for building, agriculture, mining, or other domestic purposes, any timber or other trees growing or being on the public land, said lands being mineral," etc.

Your Committee itself says this is a bad law and is liable to abuse. The Committee pledges itself to support a movement to repeal this law and get a better one enacted. Whether this law is a bad law or not as applied to unreserved public lands, Congress knew it was a bad law as applied to lands especially devoted to the growth and perpetuation of timber. It knew that its operation, whether abused or not, would devastate the Forest Reserves, and defeat the purposes of their creation. Therefore when Congress, by the Act of March 3, 1891, authorized the President to set aside and reserve lands for forestry purposes, and by the Act of June 4, 1897, authorized the Secretary of the Interior to make "such rules and regulations and establish such service as will insure the objects of such reservations, namely, to regulate their occupancy and use, and to preserve the forests thereon from destruction," Congress did by that legislation sweep away from the lands so reserved this Act of 1878, along with the Homestead Act, the Timber and Stone Act, and any other existing law which would result in destroying the forests. The Forester is simply enforcing the law as he believes it to be and is advised by his law officer that it is.

With the law of 1878 out of the way, what are the rights of the miner as to using timber? He, of course, cannot go outside of his claims to get timber from the public land. If he owns a single unpatented claim there is no question but that he can cut the

timber therefrom to use on the claim, or in connection with its development. But how is it in the case of a group of unpatented claims? I believe there is no case in which this question has been directly decided by the courts. The Secretary of Agriculture and the Forester, acting under legal advice, hold that the right of the owner of a group of unpatented claims is to cut the timber from one claim of that group and use it on another claim of the group, or entirely outside the group, if its use in that place tends to develop the claim from which it is taken. If it does not tend to develop that claim when it is used outside the claim, then he cannot take it for that purpose, and in that case his only right is to take timber from the claim for use on the same claim. In other words, we think the miner's right to take timber from a group of claims is controlled by practically the same principle as that of doing assessment work upon the claims of a group; and that is, as I understand it, that assessment work done on one claim may apply on another claim if such work tends to develop the latter claim, otherwise not. Now, I am not going to make a legal argument to sustain this position; I will only say in a general way, that we believe this to be the law because of those decisions which hold that the right acquired by the location of a mining claim is the right to possess and use it for the purpose of developing a mine on that claim, and for that purpose only. To illustrate this position, I will cite you now to only one decision: that is, *Teller v. United States*, 113 Fed. Rep. 273, decided by the Circuit Court of Appeals of the Eighth Circuit, December 30, 1901. You will there find reference to other authorities bearing upon this question. Now it is possible, of course, that we may be mistaken in this position; but we do believe it to be the law, and in enforcing it we believe we are obeying the law. If there are differences of opinion as to this, the obvious and proper thing to do is to get a case into court and have this question of law finally settled.

There has been a great deal of criticism of the Forest Service in various quarters and from various motives. I suppose there will be more. I have done a little of it myself. I am willing to admit that it is something of an anomaly in American affairs to have a great number of executive agents controlling a great territory and vested with authority in relation to certain subjects, to say to the inhabitants thereof, "You may do this and you may not do that." But in the opinion of the great body of the American people and in the opinion of their representatives in Congress already enacted into law, the end justifies the means. The preservation of forests and the protection of watersheds has come to be a matter of vital necessity to the common good. Some such scheme of control is the only practicable way of accomplishing that purpose. The legal and constitutional foundation for it is unassailable. The United States is the owner of these lands. It may do with them what any other owner of lands may do. But I would not rest this authority on any such narrow and technical grounds. These National Forests spread over the boundaries of various States. They protect the ultimate source of rivers which traverse two-thirds of

the area of the United States, and discharge their waters into two oceans. One of these rivers at least forms an international boundary. This, therefore, is a National, not a State or local affair, and the National Government has undoubted jurisdiction on broad as well as narrow grounds.

It has been said, and doubtless will be repeated, that the Government, through the Forest Service as now conducted, holds these lands and derives a revenue from them on the principle of a great baronial landed estate. This is a perversion of the facts. The United States spends in protecting and administering these lands vastly more than the revenue it derives from them. It only insists that those who make a special use and derive a special benefit from the lands so protected shall pay something for the privilege and thereby share part of the expense. The superior equity of the Western people in these Western lands which they have redeemed from savagery is recognized by turning over to the States in which the various National Forests are situated one-fourth the gross income derived from such forests to be expended on county roads and for county schools. So far as it can, consistent with the ultimate ends of forestry, the Government grants free use of timber to the prospector, the small miner, and the ranchman. By this system of free-use permits it endeavors to so provide that no man shall fail to make a home or erect necessary buildings and fences, or fail to develop a mine for want of timber needed in the early and critical stages of development.

The sudden introduction of this system of control, of conservation, of issuing permits, in place of the old free and unrestricted use, was undoubtedly a shock to many of the Western people. It could not have been otherwise. It upset the habits, the customs, the preconceptions of generations of prospectors and frontiersmen. On the part of the Forest Service mistakes were made, some injustice was done, some arbitrary and indefensible acts were committed. It was inevitable that such should be the case. When new policies are rapidly put into operation over a vast territory, through numerous agents who must necessarily grope their way to an understanding of the situation and its requirements, nothing else can be expected. But with time, with patience, by constant effort to ascertain the true conditions, and adjust regulations and administration to them; with the help and co-operation, and even the protests of the people affected, and of such bodies as the one I am now addressing, I believe that matters will be so worked out that the great and beneficial purposes of the Forestry policy will be accomplished satisfactorily to all parties. I believe they will be accomplished without subjecting any American citizen to a degrading or humiliating official control in his daily life and business affairs; without interfering with any personal or property rights; without infringing upon any of the reserved powers of the States; and without violating any of those fundamental principles which underlie our scheme of Government, and which, it should never be forgotten, are of more vital importance to the American people than the conservation of any merely material resources possibly can be.

DISSEMINATED CHALCOCITE DEPOSITS AT RAY, ARIZONA.

Written for the MINING AND SCIENTIFIC PRESS
By C. F. TOLMAN, JR.

The brilliantly stained hills in the vicinity of Ray, the stains and occasional stringers of carbonates of copper, and the sheets of native copper found in irregular veins, early attracted the attention of prospectors. Even back in the Apache days there was considerable prospecting, mining, and some shipment of native copper. Finally the best developed, and what was then considered the most promising, of the claims of this area, came into the possession of the enterprising firm of L. Zeckendorf & Co., of Tucson, Arizona, and in 1899 these were sold to English capitalists, who organized the Ray Copper Mines, Ltd. This company carried on development for about two years, building a narrow-gauge road from the mines to Kelvin, where they put up a small concentrating plant, and pushed underground work on the Ray and Tribune group of claims. Unauthentic reports put high estimates upon the total amount of money spent by the company, but I have been informed by one who was connected with the company that over a half million dollars was spent in bona fide development of the properties.

Neither this company nor those who preceded had an adequate conception of the extent of the orebody, and did not understand the character of the deposit. Development was confined to veins, veinlets, and stringers, and so this attempt spelt another failure. Ray had no railroad connection at that time. All material was hauled about 50 miles from Red Rock, on the main line of the Southern Pacific railroad. Fuel was scarce, wood costing \$10 per cord. The small mill of about 300 tons capacity did not effect a good recovery, nor could such a plant be expected to pay under these conditions. The stringers of native copper were rich but irregular, but the workings that passed through the oxidized zone everywhere ran into a sulphide-specked schist of such low grade that no thought of the possibility of this rock becoming pay-ore occurred to the miners; nor could it have been treated with profit under the conditions then prevailing. Finally, after the Bingham and Ely mines became demonstrated successes, certain Salt Lake mining men told Philip Wiseman that they would like to test other disseminated deposits. He explained that this was exactly what the Ray was, and he returned to attack the property as a great low-grade body.

Ray is situated in Pinal county, not far from the Gila county line, on Mineral creek, five miles north of Kelvin. The latter is on the Phoenix & Eastern railroad, and at the union of Mineral creek with the Gila river.

The geology of the Globe quadrangle, a few miles to the north, has been studied by F. L. Ransome. No Government examination of the Ray district has as yet been made. William H. Truesdell* described in this journal the formations at Ray, following Mr. Ransome closely. He suggests that the diabase is

the source of the ore. J. E. Spurr has just finished a detailed study of the Ray properties, but his results are not available, as they are presented to the company in a private report. It is to be hoped that the company will see fit to allow the publication of the scientific results of this examination. I have had the pleasure of recently making a geological reconnaissance of a few days duration in the vicinity of Ray, and the accompanying geological map, Fig. 1, presents some of the results of this investigation. It is, however, only a sketch made for the purpose of giving a graphic notion of the relation of the formations, and not their actual boundaries.

The Pinal schist is the oldest and the basal formation of the region. It appears as a block the greatest elongation of which is in a northwest direction. This schist is identical in all respects to that found in the Miami-Inspiration area, except that in the south-



Fig. 1. Sketch Map of the Geology Near Ray, Arizona.

eastern portion of the block, near the great fault, it has suffered greater silicification than appears at Miami. The Pinal schist has wide distribution in southern Arizona, but has not been much in favor with the prospector as an ore-bearing formation. It appears in most of the desert ranges southwest of Tucson. It is probably the upper member of a tremendous series of stratified pre-Cambrian gneisses which outcrop in the Catalina and Rincon mountains 60 miles to the south, and reach great development in the mountains of northern Sonora. To the west of the Ray schist-block is a diorite that is provisionally put in the pre-Cambrian. The Paleozoic rocks appear on the east, separated from the schist by an important fault. This series appears to be quite similar to the Globe formations named by Mr. Ransome 'the Apache quartzite' and 'the Globe limestone'. The impression given by distant views is that the Ray Paleozoic rocks attain greater development than those of the Globe quadrangle. They are not involved in the great chalcocite mineralization, and will not be considered further.

The first post-Paleozoic intrusion is a diabase appearing as sills and dikes. An examination of the

*MINING AND SCIENTIFIC PRESS, June 5, 1909.

drill-logs shows that an extensive sheet, or two sheets in places, underlies a considerable area of the low-land adjacent to Mineral creek, extending up to the Mineral creek fault described later. As the surface outcrops of the diabase are not prominent, no attempt is made to give expression to this formation in the map and sections, except the few dikes which I examined. The granite porphyry and porphyritic granite intrudes the schist, the quartzite, and the diabase (Fig. 2), and is therefore later than all of these. It resembles the Schultze granite of Mr. Ransome, which, in my judgment, was the source of the mineralization of the Old Dominion and the Miami-Inspiration deposits, but of course it is not permissible to apply that local name until the two granites are proved to be a part of one and the same intrusion. I shall therefore call this the Ray granite. Where the main mass splits into dikes, it grades into a fine-grained porphyry. It occurs as isolated knobs, entirely unconnected at the surface. The schist has been floated up on the billowy surface of this granite, the under surface forming a warped trough, and erosion has proceeded just far enough to expose a few of the upper projecting points of the granite.



Fig. 2. Cross-Section at Ray.

All the later overlying formations may be considered as a non-mineral bearing mantle subsequent to the primary mineralization, and therefore of little importance to the economic geologist in this particular case. Mr. Ransome has named the lower detrital conglomerate 'the White Tail conglomerate', and the overlying tuffs and lavas, 'the dacite', and the upper conglomerate 'the Gila conglomerate'. Had Mr. Ransome been acquainted with the great complex series of igneous and aqueous-igneous flows, of detrital conglomerates, and of lake-beds, of which the above formations are but the outer fringe, he would probably not have separated the White Tail formation from the Gila formation, and have put each in a separate geological period, because separated by a lava-flow.

Faults.—The Mineral creek fault separates the dacite and the Paleozoic rocks from the schist. It is by far the most important structural break of the region, is of great displacement, and cannot escape the notice of even the casual visitor. The schist-block has suffered intense fracturing, but the fractures have been subsequent to silicification. These silicified breccia-zones may have been lines of fault-movement, but the contorted schist does not furnish datum planes by which the dislocation may be determined. In one case such movement was proved by finding a diabase dike cut off along one of the breccia zones.

The ore stratum.—Interest centres upon the orebody, or ore-stratum, as it may be called. This develops at 100 to 250 ft. below the surface, and has an average thickness of 100 ft. under the silicified por-

tion of the schist. In the vicinity of the Sharkey area to the northwest the schist is soft, decomposed, bleached white in places, and again brilliantly colored by iron compounds. Erosion has produced amphitheatre effects in the softer spots, but nowhere on the surface is there copper. It has all gone below. It is in this neighborhood that the great bonanzas have been found, the glass model of the orebody showing how the ore-zone swells upward and downward, to thicknesses in places of 350 ft., and with copper content higher than elsewhere. The section (Fig. 3) across a portion of the west orebody, furnished by the courtesy of the Ray Consolidated Co., will give a graphic notion of the deposit as an ore-stratum or underlying ore-blanket. Recent development in the bottom, and along the banks of Mineral creek, show that the stratum extends up to the Mineral creek fault, and that the ore here is partly oxidized throughout nearly its entire thickness, cuprite and chalcocite occurring together in the diabase, which is well developed in this area.

The log of one drill-hole affords an interesting example of the processes of secondary sulphide enrichment. The 'oxidized zone' shows silicates and carbonates of copper, but the assay returns give only a trace of the metal. Then suddenly large quantities are found at the top of the secondary sulphide zone, and then the amount decreases with lessening chalcocite, until finally the pyritized schist falls below 1½% copper and ceases to be commercial ore. The lower boundary of the orebody is an artificial plane corresponding to the points where the copper falls below the economic minimum. The mineralization, however, continues to undetermined depths, the chalcocitization decreasing until finally the schist contains only primary pyrite.

The copper conglomerate.—There is an interesting occurrence of copper conglomerate in Copper canyon. The stream conglomerate at the bottom of the arroyo is cemented with carbonates and silicates of copper. Several attempts have been made to treat this in leaching plants. The deposit was formed by the seepage of a small amount of copper-bearing water out of the precipitous sides of the canyon, causing a precipitation in the gravels of the dry-wash, of copper minerals, mainly by evaporation.

Sampling the orebody.—Prospecting for and sampling of the ore has been carried on extensively by churn-drilling. The holes are placed on co-ordinates, 200 ft. being the distance between each hole. In case any hole is considerably above or below the average in copper content or shows a marked change in thickness of ore, auxiliary holes may be drilled in the neighborhood. Churn-drilling is employed exclusively, the Star machine seeming to be in favor with both drillers and management. Samples were taken at first all the way down the hole, but now no sample is preserved until the chalcocite appears. A string of three samples, however, is kept in tubs, and with each new bailing the oldest sample is discarded. As soon as the chalcocite is detected, the two preceding samples are taken. The sludge of each bailing is run through a split-box, designed by Ralph C. Nowland, the resident engineer in charge of the sampling, one-eighth of the sludge running into the sample pail, and the sample is dried and sacked.

The rate and cost of drilling is shown from the following given me by one of the drillers. One machine running from October to June drilled 14 holes, 11 of which were cased. Ten shifts were lost during this time, but frequent shut-downs of short intervals were necessitated by shortage of water; average distance per shift $15\frac{1}{2}$ ft.; average distance drilled during straight-work 25 to 30 ft. Mr. Stenger, the general superintendent of the Ray Consolidated Copper Co., states that the cost of drilling up to date has varied from \$2.25 to \$3.50 per foot.

Any statement of the ore proved will be out of date, for drilling operations are constantly adding new reserves to those already demonstrated, and as far as I am aware the outer boundary of the ore has not yet been discovered by the drilling operations of the Ray Consolidated. I believe that the Mineral creek fault is the boundary on the east, and the only boundary that can be assigned to the ore-zone as yet with any confidence. In the thicker portions of the orebody every drill-hole means the addi-

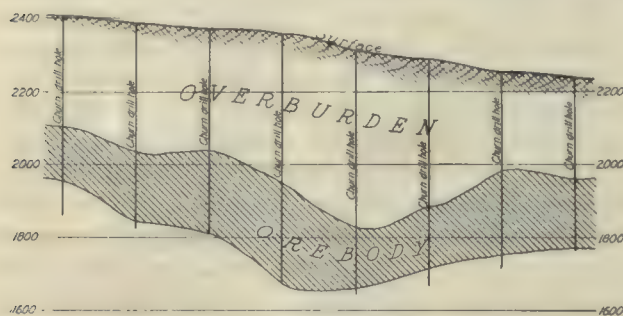


Fig. 3. Cross Section Through West Orebody.

tion of more than a million tons of ore. During March, April, and May the ore-development averaged 4,000,000 tons per month for 11 drills, and two drills have since been added. The report of the executive committee on May 22, 1909, in regard to the mineral ground not yet developed reads, "of the 1000 acres of mining claims owned, about 500 acres display the same character of rock and surface indications as the areas in which development has been and now is being carried on, and a greater part of this acreage promises the development of commercial ore deposits." The recent statement copied in this journal, to the effect that the Ray Consolidated Copper Co. has 50,000,000 tons of $2\frac{3}{4}\%$ ore developed, and attributed to D. C. Jackling, the general manager, was probably the attempt of some one not officially connected with the company, to revise former estimates and to keep them abreast of recent development. Mr. Jackling on October 2 wrote as follows in regard to this estimate: "I have been misquoted if it has been said that we have fifty million tons of ore of a grade of $2\frac{3}{4}\%$ developed at Ray. We have at the present time fully developed, by drilling and underground checking, approximately thirty-seven million tons of ore of a grade of 2.3%. The area fully developed is approximately one hundred acres. There is, of course, a very large quantity of ore that is partly developed and indicated by drilling, but while these incomplete developments give assurance that we will develop many more million tons of ore than the amounts above stated, and in all probability much more than is already developed, the positively and fully de-

veloped ore at the present time does not exceed the above stated figure."

The Gila Copper Co., owning neighboring land, claims to have about one-half as much mineral-bearing ground as the Ray Consolidated; formal development, however, has been only recently started, and is now being pushed in connection with the work of the larger company. No authoritative estimate of the tonnage of the Ray Central Co. is known to me. Their holdings, while not as extensive as the Ray Consolidated and the Gila, overlie the centre of the ore-stratum, and when worked will add materially to the product from this great orebody. The Hercules & Arizona owns some of the richest ground along the Mineral creek fault.

The thickness of the capping will necessitate caving operations, and the high assay value of the ore, compared with other deposits of anything like the same size, will probably more than offset the higher cost shown by caving methods in the past over steam-shovel mining. I am sanguine as to the results that will be accomplished when proper caving methods for such an orebody as the Ray are perfected. It is not impossible that caving operations on a large scale will show even lower costs than the average for steam-shovel work.

CARE OF THE GAS ENGINE.

By L. H. SNYDER.

*A gas engine should give good satisfaction if carefully looked after. Do not put it in a place where the rain will beat on it or the first thaw will drench it with water. The weather may turn cold and there will be a hard freeze, to say nothing about the dirty mess and the rusty parts. Always make it a point to see that the oil cups are turned off and filled, when you shut down, then they are always ready for use. It soon will become a habit to do this and to open them in starting. I prefer an engine which has grease cups rather than oil, because the grease will be used as needed, and there is not the danger of going away and leaving the lubricators open, which means so much oil wasted, fire-risk increased, and the cups run dry. The cooling water should be adjusted so that the discharge is at a temperature of about 200°F . for the highest efficiency, and in the winter, as an extra precaution, I would advise drawing all of the water out of the tanks as an insurance against a cracked cylinder. Alcohol may be used as an anti-freezing solution, but I would go to the extra trouble of drawing out the water, even if alcohol is used, as it will evaporate in time.

Failure of a gas engine to start is usually due to one of the following causes: First, there is no gasoline in the fuel-tank; second, no spark, weak batteries, loose or broken connections; third, excessive back-pressure or clogged exhaust; fourth, the firing apparatus not working properly; fifth, in winter, when the fuel-tank is outside, and it should always be there as a precaution against fire, it may be found that the gasoline is too cold to vaporize and it will be necessary to warm the carburetor by wrapping hot cloths around it (never use an open flame); sixth, the mixture may be either too strong or too weak.

*Abstract from *Gas Review*.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Idle Mining Claims.

The Editor:

Sir—Referring to the article of Mr. Edmund B. Kirby in your issue of October 2, I agree with Mr. Kirby in the general idea of the article and in nearly every particular. But why does he not add that such a law as he proposes is exactly what Mexico has today. An example in actual successful operation will do more to remove that natural timidity of the general public in regard to changing the law than any amount of argument. This law has been long in operation; it answers the purpose of encouraging the development of the mineral resources of the country; it is satisfactory to all parties concerned: the American investor finds no cause to complain of trouble over his titles; in fact he has less trouble over titles in Mexico than in his native land. It may not be patriotic to say so, but the truth is that, for developing the resources of the country, the laws of Mexico are far better than our own. They accomplish the very object which Mr. Kirby so earnestly aims at. Parties with a large 'acreage' receive a perceptible jolt at every recurrence of tax assessment returns with the result that they begin to drop off from their outer holdings what they do not really need. Property thus abandoned reverts to the general Government and is at once open to any one who desires to take it instead of passing into the hands of the tax-title shark where it is still further removed from any chance of early development.

VICTOR G. HILLS.

Denver, Colorado, October 21.

Carbons for Diamond Drilling.

The Editor:

Sir—In the issue of the MINING AND SCIENTIFIC PRESS of August 21 appears an article by John M. Fox, entitled 'Diamond Drilling at Tonopah'. In this article reference is made to what is called 'doctoring' carbon, and Mr. Fox apparently bases his remarks upon conditions of affairs which existed more than ten years ago. In the first place, the sale of carbons, or black diamonds as the stones are better known, is confined to not more than six separate companies which are all well known, and would not dare to practise the unscrupulous methods mentioned by Mr. Fox. These companies, with the exception of one which has its own source of supplies in Brazil, buy their carbons unbroken from European dealers and they, themselves, split or break the carbons after they have reached this side. Competition in this business is so keen, and the field is confined to so few companies, that such dishonesty or deception would soon ruin the company indulging in such practice.

Mr. Fox, however, has ground for asserting that stones have been colored, but this occurred, as the writer has hinted in the foregoing statement, a num-

ber of years ago. The erroneous opinion that all good carbons were black caused users to fight shy of carbons which were of a reddish tinge or gray, although these stones were as well adapted to drilling purposes as the black stones. This avoidance of the so-called 'off color' stones became a source of concern to one of the dealers as he found himself carrying a stock of carbon gray or red in appearance, altogether too large for his comfort. Knowing that these stones were first-class and equal to any on the market he had little hesitation in coloring them so as to make them marketable. This practice he continued for some time until the prevailing erroneous opinion regarding the proper color of diamonds for drilling was wiped out. This came about gradually, and at the present time and for several years past no attempt has been made to deceive the purchaser by coloring the carbons. Owing to the limited number of companies engaged in the sale of black diamonds, and because of the harm that might be done them because of Mr. Fox's statements, I hope that you will see fit to print this letter.

IMPORTER.

New York, October 20.

Economic Conditions in Colombia.

The Editor:

Sir—I have read, with much interest, the second article regarding Colombia, by F. Lynwood Garrison, April 17, regarding malaria. I thoroughly agree with the theory that the malady is conveyed by mosquitoes. I have a vague idea I read in a pamphlet of the Liverpool Tropical School of Medicine, that the 'Culex' mosquito, the yellow fever variety, possessed a very short proboscis, and the 'Anopheles' an extremely long one. Also I believe it was stated the male proboscis in the latter class was longer than that of the female. It was also stated that the male alone conveyed infection, but that for every male there were more than a hundred females. Now, I contend that sheer 'funk' is the cause of malaria to a great extent, or at least its evil effects; if a man pauses to see, after 'swatting' a 'stika' if the proboscis is short or long, the best thing he can do is to clear out of the country, for it is very probable he will go under. In the jungles of North Queensland, Australia, the Anopheles is plenteous, and malaria, dengue fever, and even beri-beri, and various other malignant fevers are rampant, but few deaths result. In a year probably not more than a score die from these causes, excepting, of course, at Townsville where the 'new chum' congregates.

The prospectors, miners, and timber-gatherers, all whites living there, take no notice of the mosquitoes except to abuse them, nets are few and far between, and quinine scarcer than whiskey. On the other hand, in West Africa, where the white man is pampered, and he has his clinical thermometer, and drug-case, and stock of scarce literature, it is no wonder the deaths are many. Let a man live clean, avoid the frying-pan and greasy foods, take warm baths and wear white and light clothing, clean, and with frequent changes, take a little whiskey and quinine, the both strictly in moderation and work, not molly-coddle himself, keep dry feet by being well shod, and

he need not fear malaria and kindred ills. I put in three years in the jungles of West Africa, and five in the fever country of North Queensland, and one year in New Guinea, the most fever ridden spots on earth, and in the whole time never lost a day with fever. It is well to remember many hold the idea that the excessive use of quinine is cause of the dreaded 'black-water' fever. Also remember that simple malaria without complications has never been known to cause death, and that 'cowards die many times before their death'.

ERNEST H. VAUGHAN.

Rodeo, Argentine Republic, June 6.

A Russian Money Trust.

The Editor:

Sir—The article entitled 'A Russian Money Trust', in your issue of August 7, by George E. Walsh, appears to treat in a rather general way a subject upon which much accurate information is available. He says "Half a dozen mine owners control the platinum-producing districts of the Urals around the mining settlement of Miac," etc. I presume the settlement referred to is Miassky Zavod on the line of the Trans-Siberian railway. This will be news to the fortunate gentlemen referred to, and perhaps Mr. Walsh will be good enough to give you their names, so that you can mail copies of the issue to them, with his regards. The statement that Russia used this "absolute monopoly" "to help her recuperate" after the close of the Japanese war is certainly an astounding piece of information. Since 1898, when I first visited the Iss platinum fields, I have been under the impression that the bulk of the Ural platinum claims are held by a French company. This company has also a long contract with the Shuvalof Estate, its principal competitor, for the purchase of all the latter's raw platinum at a fixed price per pood. These two producers operate in the Iss, some 300 miles north of Miassky Zavod. A smaller producer of low-grade platinum is Demidof, at Tagil, 50 miles south of Verkotur.

Last winter in St. Petersburg I had the pleasure of a consultation with a gentleman who is the manager of Mr. Polyakof's platinum property, on the river Lozva, some 500 miles north of Miassky Zavod (Miac?). A Putilof dredge worked profitably on this mine during 1908, and the platinum was disposed of entirely independently of the French Iss company. To my knowledge there are at least 100 independent peasant operators on the river Tura, and platinum dust passes current among them for purchase of tobacco, tea, etc. As these people are for the most part working illegally on other owners' ground, it does not seem that any very close watch is kept.

For \$2.50 Mr. Walsh or any citizen of the United States may obtain a permit to locate and patent platinum-bearing ground in the north Ural, produce platinum, and sell it where he pleases. I have been the possessor of such a permit for ten years, and it is good for life. Large areas of the north Ural in the platinum belt remains unprospected; free Government lands open to location. Some new deposits will probably be found. At present it is true that a practical monopoly of the platinum business, regulated from Paris, exists. To break it up seems hardly the

legitimate function of the United States Geological Survey, but would be a quite conceivable object for a private company. That all the platinum ground in Russia is now in the hands of one company, or group of producers, is, however, very far from the truth.

Mr. Walsh should remember that railway trains go far nowadays, and it might pay him to buy a ticket to the station of Goroblagodat on the Perm railway, in order to more closely investigate the platinum situation. As I expect shortly to be coming back to London by way of the Trans-Siberian, I will look out of the window at Miassky Zavod, to see what is going on. The train goes through rather early in the morning, but possibly I may see one of the Miac syndicate out shoveling, if he happens to be working on the night shift.

C. W. PURINGTON.

Nikolaievsk, East Siberia, September 15.

Colloids and Adsorption.

The Editor:

Sir—In your issue of September 25, 1909, page 425, appears a paragraph on adsorption in which this sentence is found: "Adsorption is especially characteristic of the peculiar substances known as colloids which form the bulk of clays and on which their plasticity is believed to depend."

It is true that the mineral grains of most clays are coated by a film of colloidal matter, and in some cases this colloidal matter may constitute the bulk of the clay, as in some impure surface clays, but the colloids play a smaller part in the composition of most clays, it being claimed that in many of the common clays there is but a small proportion of the total ingredients which are capable of assuming the colloidal state by the action of water alone (Iowa Geological Survey, 14, p. 90, 1904). In the case of many kaolins, the purest of all clays, there is some doubt as to the existence of colloids. Schlossing found that there were what he determined to be colloidal substances in koalin, and found them to be singly refracting, but Kasai, on the other hand, disputed this, since he determined the apparently colloidal material to be doubly refracting.

Regarding the plasticity of clays and its causes, the colloidal theory (see Ashley, Transactions American Ceramic Society, 1909, p. 530) is probably the most widely accepted today, but this does not in any way conflict with the affirmation that the colloids are present in but small amount. Grout found (West Virginia Geological Survey, 3, 1906) that using a dilute solution of agar-agar, 0.08%, increased the plasticity of certain clays from 36 to 60%. The colloidal theory does not seem to have received much attention in this country. Many writers hold to the molecular attraction theory. Ladd (Georgia Geological Survey Bull. 6A, p. 39, 1908) advocates the theory that the mutual attraction between water and clay particles and surface tension between the water films determines the plasticity to a large degree. Purdy believes that plasticity is due to adsorbed salts, or to salts otherwise held, that on addition of water form a viscous solution about the grains.

E. K. SOPER.

Ithaca, New York, October 7.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Tailing is the property of the patented land on which it lies. It makes no difference as to its origin, nor how it came there. The only way in which such tailing may be acquired is by purchase. Tailing on land open to location becomes the property of the locator of such land.

Nitrogen of the air amounts to about four billion tons. On the basis of the present annual consumption, allowing no replacement, the air contains enough nitrogen to provide fourteen thousand million years' supply of saltpeter. The world's demand increases by about 100,000 tons per annum.

Mule-back haulage is not an anachronism. The deeply carved escarpment of the western Sierra Madre in Mexico forbids the construction of permanent wagon-roads, and railways will be few for many decades. Meanwhile the mineral development of that region is proceeding at such a pace that a greater demand for the services of the *arriero* and his *atajo* will exist ten years from now than has ever been witnessed in the past.

Clay may be defined as a mixture of minerals, chiefly silicates of aluminum, iron, the alkalis, and the alkaline earths. Predominant among these is kaolin ($\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$). Some feldspar is usually present. Upon most of these residual un-kaolinized grains is a film of colloid. The colloid material may be partly organic, and also consist of colloidal iron, manganese, and aluminum hydroxides, and colloidal hydrated silicic acid. The plasticity is now generally considered to depend upon the amount of colloid present, though other causes are urged.

A **catalytic agent** is a substance which promotes a chemical change, or interaction between two substances, without itself suffering any permanent change. The change may be of a positive, accelerating, or of a negative, retarding, character. Water vapor in small traces promotes the chemical action of oxygen with many of the elements, which show no tendency to unite with carefully dried oxygen, even when they are strongly heated. In fact, water is to be regarded as one of the commonest catalytic agents. Only a few cases of retardation of chemical activity by catalytic agents are known.

Asphalt is a general term which denotes the various forms of bitumen or mineral pitch found in nature or produced by refining processes. An essential property of asphalt so defined is that it melts at temperatures near that of boiling water; this property makes it available for use in various industries. Natural asphalt is not known in the United States in sufficient quantity to warrant exploitation at present, though it is widely distributed in California. Certain crude petroleum in California, Texas, Kansas, and Oklahoma contain considerable quantities of asphalt in solution, the proportion rising to more than 35% in some oils. Gilsonite, grahamite, and other hard bitumens are found in several of the

Western States, notably Utah and Oklahoma. Bituminous rock, including all kinds of rock that contain an appreciable quantity of asphalt or bitumen intermingled with the rock particles, occurs in California, Utah, Oklahoma, Texas, Kentucky, and Wyoming.

Pitch-blende occurs in fissure-veins, in igneous rocks, such as granite. It is valued for its uranium and radium content. It is not found in sedimentary rocks like sandstone, although alteration products of it may be found therein. Such alteration products are colored yellow or greenish, and, when in sufficient concentration and quantity, are valuable for their uranium content. The radium value in these is small, as a rule. It is found in vein matter in stringers varying from knife-blade thickness to several inches. It is 'bunchy'. The associated minerals in addition to vein matter are sulphides such as zinc blende, galena, and iron pyrite. The latter usually predominates.

Monazite is essentially an anhydrous phosphate of the rare-earth metals, cerium, lanthanum, and didymium ($\text{Ca, La, Di} \text{PO}_4$). There is nearly always present a varying but small percentage of thorium, ThO_2 , and silicic acid, SiO_2 , which are very probably united in the form of a thorium silicate, ThSiO_4 . Some monazites contain but a fraction of percentage of thorium, while others have been recorded that showed the presence of from 18 to 32%; but the majority contain from 3 to 9% of this oxide. It is the presence of the thorium oxide that gives the monazite its commercial value. The analysis occasionally shows also the presence of other constituents, as the yttrium and erbium oxides, zirconia, alumina, magnesia, lime, iron oxides, manganese oxide, and titanium oxide.

Polymorphism is a phenomenon shown by many minerals. Some substances are known to occur in more than one kind of crystalline form, that is, with different crystallographic molecular arrangements. For example, monoclinic and orthorhombic sulphur; the different forms of TiO_2 , rutile, anatase, brookite. Compounds occurring in such a manner are said to be polymorphic. They yield identical liquids, solutions, and vapors, and must have identical chemical molecules. Whether there is any other molecular difference between polymorphic forms of one compound than the crystallographic arrangement of the molecules is not always determinable. In some cases the change from one polymorphic phase to another may be accompanied by molecular polymerization. In general, polymerization, or the existence of different multiples of the simplest molecules in different phases of a substance, is indicated upon the transition, or inversion, of a substance from one phase to another by the liberation, or absorption, of a large amount of heat. Whether there is polymerization in the pyrogenetic compounds upon crystallization from molten liquids is a debated question. According to Doelter some of the pyrogenetic silicate minerals yield much heat upon crystallization, indicating polymerization upon crystallization. But Vogt concludes from his study of slags that there is little or no polymerization of the silicates formed in them.

Special Correspondence.

LONDON.

Mexico Mine of El Oro.—Tomboy.—Caucasus Copper.—Yuspenssky Copper.—Development Policy.

Details are now to hand relating to the Mexico mine of El Oro, situated immediately to the north of the Esperanza, which in turn is to the north of the El Oro. The report of the company for the year ended June 30 shows an increase in the efficiency of the plant and a decrease in costs. During the year under review 101,105 tons of ore were crushed and treated by cyanide, yielding \$905,062 gold, and \$352,496 silver, a total of \$1,257,559. The extraction was 94% of the gold and 87 of the silver. In addition, 500 tons of rich sulphide, containing metal worth \$112,294, was sold to the smelter, and gave a net return of \$91,706. The total mining costs, including development, were \$573,450, or at the rate of \$5.67 per ton, which compares favorably with the figures for the previous year, which were \$6.33. The ore reserves on June 30 were 191,655 tons, assaying \$10.90 in gold and 7 oz. of silver. The most interesting discovery during development was in the seventh, or bottom level, where a vein of sulphide ore was struck 500 ft. from the shaft, 15 ft. wide, and assaying 2½ oz. gold and 20 oz. silver. This orebody is part of a northern extension of the west vein in the adjoining Esperanza. The total receipts during the year from the sale of bullion and ore, interest, and other sources, were £280,815, and the costs at the mine and in London were £125,649, leaving a gross profit of £155,166. Out of this, dividends amounting to £112,500 have been paid, £25,000 written off cost of plant, and £8300 provided for income tax. The company was formed at the end of 1904, and commenced to pay dividends just a year ago, when £45,000 was distributed. The paid up capital of the company is only £180,000, and the dividends already distributed amount to £157,500.

Another property under the control of the Exploration Co. is the Tomboy Gold Mines, Ltd. This company operates the Argentine mine, at Telluride, Colorado. The report for the year ended June 30 shows that the content of the ore continues to decrease, a fact which has a decided effect on profits. Two years ago the profit was £155,310, and a year ago £87,115, whereas for the last fiscal year the profits were only £59,861. The amount of ore milled was 102,844 tons, which yielded \$487,486 by amalgamation, and \$332,970 by the sale of copper and zinc concentrate. Other small items, amounting to \$12,112, brought the total receipts to \$832,569. A year ago the figures were: 104,091 tons of ore, \$657,561 from the plates and \$341,459 from the sale of concentrate. The amount of ore reserves on June 30 was 400,000 tons, which is practically identical with the amount a year ago. The working costs have been reduced during the year to \$4.67 per ton, as compared with \$5.13 a year ago. The year commenced with a balance in hand of £66,331, which, added to the profit, made a disposable balance of £125,594. Out of this sum, £60,000 has been paid as dividend.

Nowadays, when low-grade copper ores are proving payable, there seems to be a chance for the unfortunate Caucasus Copper Co., which has been for the last nine years trying to make a success of the low-grade but extensive copper deposits at Dzansul, Caucasus, Russia. The capital has been provided by a number of substantial mercantile houses at London, and members of the firm of J. S. Morgan & Co., the English branch of J. P. Morgan & Co., have, perhaps, the largest holding. The concentration and smelting problems have been extremely difficult. Some of the best talent in England and America has been requisitioned in vain. At first it was thought possible to smelt the ore without concentration, and large sums of money were spent in the attempt. After that, efforts were made to concentrate magnetically with equally unsatisfactory results. More recently, by the advice of one of the directors, James Colquhoun, late manager for the Arizona Copper Co., another effort has been made to concentrate on tables. The ore is friable, and a large proportion of slime is formed, so that the recovery is low. The exact figures of extraction are

not given, but a sentence in Mr. Colquhoun's report gives some indication of the situation: "Counting on no more than a 50% extraction, which, of course, will be exceeded, the property can be brought into a highly profitable condition." Tables to treat 250 tons per day are already at work, and additional tables now under construction will shortly increase the amount treated to 500 tons per day. Close study is being made of methods of dealing with the tailing and slime. After many initial difficulties, the reverberatory furnace began to run successfully in September, and the output is now about 110 tons of copper per month. Mr. Colquhoun has had charge of operations since April. According to the report for the year ended May 31 just issued, it is seen that the indebtedness of the company has been increased by £293,100 during the year. Of this amount £191,540 has been spent on new plant and in acquiring additional copper properties adjoining, while of the remainder, £66,690 represents the loss on the working account. The liabilities of the company amount to £1,511,727, of which £500,000 is in ordinary shares, £503,100 debentures, £452,900 in loans, and other creditors £55,727.

Another Russian copper mine that has had a rough time is the Yuspenssky, in the Akmolinsk district, of Siberia, owned by the Spassky Mine, Ltd., a company which also owns the smelter at Spassky, and the Karagandy coal mine. This property is very different from that belonging to the Caucasus company, for it contains an unusually rich ore. At the hanging wall the ore is practically pure chalcocite, then comes bornite also nearly pure; afterward a silicious gangue gradually reduces the copper content. There is no actual foot-wall, and the question to settle is the economic limit in each cross-cut. When the company was first floated the market boomed it wildly, and the shares went to a high premium. Certainly the nature of the ore deposit justified to a certain extent the enthusiasm of shareholders, who also had the advantage of reliable reports by Pellew-Harvey & Fell, and by E. T. McCarthy. There have been many difficulties in the way of successful operation, such as want of transportation conveniences, unsympathetic labor, and terrible weather in the winter, but bad management has also much to answer for. Last year the directors made a general sweep of the staff in Siberia, and appointed H. C. Woolmer, general manager, F. C. Knight, smelter manager, R. M. Percy, superintendent at the Karagandy coal mine, and C. Farmer, manager at the Yuspenssky mine. It was found that far too much permanent work had been done at the surface at all three points, and it became necessary to dismiss many of the workmen. Development on a large scale was stopped at Karagandy, and extra efforts were made to get the company's railway between the coal mine and smelter into such efficient order that plentiful supplies could be stored at each point, and thus make it unnecessary to operate the railway during the winter season. One of the great hinderances to successful operation hitherto has been the constant exhaustion of supplies. For instance, there might be plenty of fuel at the smelter, but the supply of ore ran short. During the year ended September 30, 1908, the amount of copper produced was 1322 tons, which realized £102,697. Of this amount 430 tons were produced during the first six months, and 892 during the second half. Mr. McCarthy states that the re-organization is progressing satisfactorily, and that costs are being cut down in many directions. For the present the production of copper will not be greater than 200 tons per month, and only one furnace will be in use. Early next year another furnace will be blown-in, and the output will be accordingly increased. Mr. McCarthy has lectured the shareholders for their continued demands for figures relating to ore reserves. He gave them some information about the nature of the deposit and the method of mining that is advisable, explaining that this was a case where the craze for 'ore reserves' and the development of the mine years ahead of the smelter-capacity would only embarrass the engineers. With a hanging wall of this kind, which always requires careful watching, there is reason for restricting development.

The Selukwe gold mine, in Rhodesia, has fallen on evil days, and the directors are doubtful as to the best policy to adopt. The mine is situated 120 miles northeast of

Bulawayo, and operations commenced in 1898. The company was floated by the Bechuanaland Exploration Co. The capital is £321,000, and the only dividends have been three at 10% each, distributed in August, 1902, and February and August, 1903. Some of the shares were issued at a substantial premium. For the last few years losses have been made, and the report for the 12 months now issued shows a further loss. Forty stamps crushed 61,392 tons and yielded on the plates 11,799 fine oz. The cyanide plant treated 41,618 tons and produced 3050 fine oz. Together with 31 oz. recovered in concentrate, the total yield was 14,881 oz., which sold for £63,357. It will be seen that the yield by amalgamation was 3.84 dwt., and by cyaniding 1.46 dwt. per ton. The costs of mining, milling, and cyaniding were £62,969, but in addition to this the costs are increased by £13,223 for development and repairs, and £17,004 for depreciation. The debit balance for the year's work, without taking into consideration any London expenditure, is £29,000. During the previous year the loss was £13,000, and the year before that £28,647. The financial position of the company is therefore serious. The outlook at the mine is far from encouraging. As the developments did not disclose any payable ore the directors acquired adjoining claims containing the Nigger Reef, but

large returns and just entering upon a career of production, the best of the Cobalt properties, with large surplus and astonishing dividends, are almost wholly neglected for the porphyry coppers. These admittedly require five years of time and large expenditures to bring them to production, and may or may not be profitable, depending largely upon the engineers and metallurgists in charge. The public pays apparently little, if any, attention to dividends, mine values, financial condition, or mine or financial management, so long as a market quotation allows the counting of paper profits.

Rumors of possible apex trouble between the Tuolumne and the North Butte, based upon the filing by the latter company of an unimportant quit-claim deed, were made the ground of an attack upon the shares by a large short interest, aided in turn by active bear traders. The stock broke from \$4.25 to \$2.93 and rallied the moment holders realized they had taken fright at a shadow. The shares recovered more than one point in a half day's trading. The news of a very important strike in the Lucky Tiger, near Moctezuma, Mexico, created no little interest in local mining circles. A telegram states that the Sooy vein has been opened up on the seventh level exposing an orebody assaying 120 oz. silver and \$4 gold. The property was examined

recently by a prominent firm of engineers acting for English interests, and appearances at the time were such that the option held was allowed to lapse. Now the owners, who are mostly capitalists of Kansas City, Missouri, are congratulating themselves that the deal did not go through.

It is anticipated that the next statement of the Copper Producers' Association will show a sufficient decrease in stocks on hand to impart a materially better tone to the market. Just at present the market is quiet, with prices ruling somewhat lower, electrolytic at 12¾ to 13, with lake grades at 13 to 13¼. The talk of a copper combination which has been heard for the past two months seems to have been hushed for the present, though the fact that the Phelps-Dodge company is now the largest individual holder of Greene-Cananea, and the further fact that during the past few days there has been some exceedingly heavy buying of Butte Coalition,

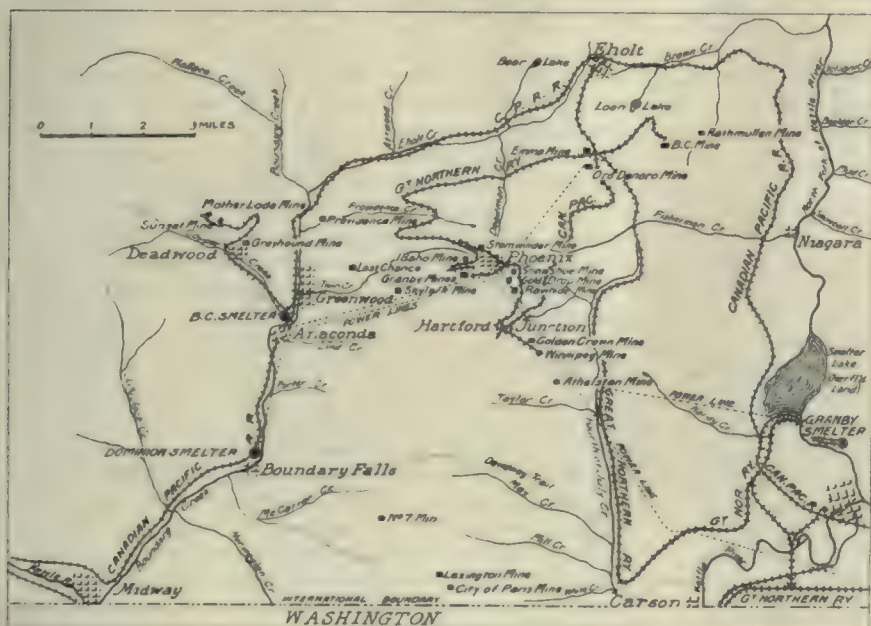
said to be for account of the Amalgamated would seem to show that these important factors in any such organization are at least working into close relations. Butte was quite a heavy buyer of Davis-Daly in the Eastern market.

BRITISH COLUMBIA.

Rossland Items.—Phoenix Output Increasing.—Vermillion Forks Coal.—Telkwa District.

The Le Roi 2, Ltd., the only company paying steady dividends in Rossland district, has declared another of two shillings per share. This is the third payment of like amount this year. The bond which Charles Dempster, of Rossland and New York, has been working under on the Hattie Brown property in the South Belt has been permitted to lapse. One of the principal payments fell due a few days ago and while the bondholders were willing to go ahead with development, they did not feel warranted in making any big payments on the principal sum. Contracts have been let for the haulage of ore and concentrate from the Velvet mine to the railway siding near Frontier, a distance of seven or eight miles. Two four-horse teams will be able to handle the output of the mine for some little time to come. The actual hauling of ore has not begun as yet, but things are being put into shape as fast as it is possible to do so.

With seven big furnaces working full blast at the Grand



Part of British Columbia.

this is proving to be equally unsatisfactory. The amount of ore exposed is about 60,000 tons, but only a quarter of this is payable. The engineer's estimate is that 15,291 tons in a vein 30 in. wide, averaging 8.63 dwt., are payable, while 102,113 tons are also developed, but will not pay for extraction. Under these unfavorable circumstances the directors have requisitioned further expert advice, and have postponed the shareholders' meeting until such has been received.

NEW YORK.

Ely Stocks.—Lucky Tiger.—Copper Combination.

In the New York mining market the continued advance in shares of the companies operating at Ely, Nevada, has been unquestionably the feature. Ely Central continued its leadership, backed by a spectacular advertising campaign and vigorous support, in the face of occasional large profit-taking selling orders. Ely Consolidated, McDonald Ely, Ely Witch, Ely Northern, and some other stocks of the Ely camp, have also been active. Some arbitrage business has been done between New York and Salt Lake. Indeed the Mormon capital seems to be the Western centre of activity in the shares. While traders have welcomed anything in the way of a real market movement, some of the more conservative have commented upon the apparent perversity of the public. Properties like Goldfield Consolidated, yielding

Forks smelter and increased activity at the Greenwood smelter, demanding a heavy tonnage of ore for treatment, the output of the Boundary mines for the week ending October 23 exceeded all prior records and went up to 43,569 tons. The Granby company shipped nearly 9000 tons more than for the first week in October, and surpassed the former high record for this year of February 13 by 2000 tons, sending out 27,573. Next week it is likely the eighth furnace will be put to work. The shipments from the Mother Lode mine last week were the heaviest that have been sent from the mine so far this year; namely, 11,396 tons. Shipments from the Oro Denoro were above the average for this property, 950 tons going to Greenwood. The average shipment was sent out from the Snowshoe to Trail smelter, amounting to 3650 tons of ore. Since the Dominion Copper Co. closed down last year there has been owing to the miners about \$22,000. The New Dominion Copper Co. did not feel obliged to liquidate this debt, but the desire to avoid friction caused the company to propose to pay on the basis of 75c. on the dollar. The local merchants have agreed to discount all accounts related to this matter 12½%. The miners have accepted the combined offer. A crusher will be removed from Boundary Falls to the Rawhide mine in a few days. Work may be got under way there the early part of this month.

The Vermillion Forks M. & D. Co. will shortly get out two cars of coal for the Hedley Mining Co. for test purposes. This coal can be shipped into Hedley from Princeton and sold at about half the cost for fuel from the Crows Nest and other districts. The Vermillion Forks company expects to find a ready market for part of its product in Spokane, Washington.

For some time speculation has been rife as to the value of the coal and copper deposits of the Telkwa district of northern British Columbia. The coal deposits have now been examined carefully by a prominent Pittsburg coal expert whose report is considered favorable. The coal appears to be of a good quality for coking or steam purposes and in places is found in large quantities. It is expected that the Grand Trunk railway will build a branch line to tap the district. It is said that one big syndicate has located 72 miles of Telkwa coal land. The Extension mines, Vancouver island, where an explosion recently caused the death of 33 miners, have been re-opened.

BUTTE, MONTANA.

October Production.—North Butte and Tuolumne Dispute.

The mines of the Butte district are producing more copper at present than at any time since 1906, when copper stood at 25 and 26c. Every company operating in the district is producing at normal rate, and a few mines at capacity. Extraordinary development is also being done by the Butte Coalition, Anaconda, North Butte, Original, Trenton, Butte & Superior, Tuolumne, Butte-Ballaklava, East Butte, Davis-Daly, and Butte & Boston companies. Activity among the large and small companies indicates anything but fear as to the future of the copper industry. The production, in October, aggregates slightly more than 28,000,000 lb., the different companies contributing to the total as follows:

| Companies. | Copper, lb. |
|---------------------------|----------------|
| Boston & Montana..... | 8,100,000 |
| Anaconda | 6,700,000 |
| North Butte | 3,640,000 |
| Butte Coalition | 3,200,000 |
| Original | 1,670,000 |
| Butte & Boston..... | 1,200,000 |
| Washoe | 1,000,000 |
| Parrot | 675,000 |
| Trenton | 750,000 |
| Pittsburg & Montana | 610,000 |
| Davis-Daly | 300,000 |
| Miscellaneous | 220,000 |
| Total | 28,065,000 |

The North Butte Mining Co. expects to reach the Jessie vein in the 2200 cross-cut in about a week or ten

days. Some significant work is also being done on the 1600-ft. level in the Jessie ground, where a drift is being driven east as rapidly as possible. It is surmised that the purpose of this drift is, mainly, to prove the continuity of the vein and orebody from the Jessie vein and workings to the vein recently opened by the Tuolumne company at a depth of 1400 ft. Ever since the Tuolumne company cut into the rich vein on the 1400-ft. level north of the Tuolumne shaft, it has been asserted that the vein belonged to the North Butte and would be found to apex in the Jessie claim. A serious phase was given the dispute between the two companies when it became known that the North Butte company had quietly become owner of an interest in the Tuolumne ground. Unknown to the officers of the Tuolumne company an interest in a small fraction was outstanding and the North Butte purchased it. The purchase amounts to a three-eighths interest in an acre of ground along the northern portion of the Tuolumne claim. The latter unites with the Jessie of the North Butte company and when the two claims were located many years ago they slightly overlapped. The Tuolumne was the older location by about four days and its owners adversed the Jessie location. The result was a controversy and a division of the conflicting portions of the claims, but the portion in question went to patent as part of the Jessie, the Jessie owners then deeding half of it to the Tuolumne owners. By that transaction it did not, however, become part of the Tuolumne claim, but remained a separate parcel of ground, though owned by the same men that owned the Tuolumne patented ground. In the course of time a three-eighths interest, owned by Patrick Henry Meagher, a Montana rancher, was lost sight of and even he had forgotten its existence until a search of the record discovered the break in the Tuolumne's title. When it was discovered and brought to the attention of Mr. Meagher he offered it to the North Butte company which quickly bought it. This makes the North Butte company joint owner with the Tuolumne in the ground of the latter company. Under a statute of Montana, made to fit some phase of the mining controversy between the Amalgamated Copper company and F. A. Heinze, one owner of a mining property cannot work it without the consent of the co-owner, and as a co-owner the North Butte has the power to stop the Tuolumne from working its own property regardless of any question that may arise as to the apex of the vein being developed by the Tuolumne company. The officers of the latter claim they are not at all concerned about the action of the North Butte, and that the most cordial relations exist between the two companies. However, many stockholders of the Tuolumne cannot see wherein there is proof of cordiality in the purchase of the interest in the Tuolumne ground by the North Butte. They can see in it only the acquisition of a weapon, and whether of defense or offense remains to be seen. It is almost certain that the North Butte did not buy it as a souvenir.

MEXICO.

Zacualpan.—Magistral-Ameca Copper. — Castellane Con., Jalisco.
—El Mirado, Tepic. — Pachuca-Zimapan Railroad. — Sinaloa
Mining.—Oaxaca.

The owners of the Cuchara mill, near Zacualpan, in the State of Mexico, have been making extensive alterations to the plant. The last of the new concentrating tables are being erected, and the mill will soon be ready for operation. The work has been done under the direction of Mr. Newcomb, of the firm of White & Newcomb, of Mexico City, and under the immediate superintendence of Manager Chabaud. A considerable amount of American capital is invested in the enterprise, which is a silver-lead mine. The owners are making plans for the installation of a complete plant of power-drills.

The Magistral-Ameca Copper Co. owns the Magistral copper mines, about two hours' ride from Ameca, State of Jalisco. These mines were originally owned by Patsy Clark, but he finally turned them over to his nephew, J. P. Harvey, and associates, who formed the above company and raised sufficient capital to carry on the work. H. L.

Percy is president and J. P. Harvey is manager. The controlling company is incorporated with a capital of \$1,500,000, and the local Mexican holding company with \$100,000. They have now ordered a 150-ton reverberatory smelter. The concentrating problem has been a serious one, and an almost endless number of tests and experiments have been made. The Elmore flotation process has been under consideration, but the latest advices are that an ordinary wet concentration plant will be erected. The bulk of the low-grade ore averages about 3% copper, with a highly silicious gangue, but there is a considerable amount of rich sulphide ore, and the smelter will be installed in any case. Orders for the equipment have been definitely placed.

A Chicago company, incorporated with a capital of \$1,000,000, has taken over the Centralia mines in the Hostotipaquillo district of Jalisco. This property is close to the mines and mill of the San Felipe company, of Philadelphia, and arrangements will be made to treat the ores of the Centralia mines, for the time being, at the reduction plant of the San Felipe company. Samuel O. Morris is the manager in charge.

The Castellane Consolidated Mines, Ltd., of London, are the owners of 17 mines in the Territory of Tepic. They have been unwatering one of their properties, the old Guanajuatillo mine, but found that the vein was too small, and the orebodies were not of sufficient extent to warrant further expenditure of capital at the present price of silver. It is hoped that the Chapala Hydro-Electric & Irrigation Co. will run its power lines near the reduction-plant owned by the Castellane company on the Santiago river, and as soon as power is available the plant will be re-modeled and enlarged.

The Territory of Tepic is improving, so far as mining enterprise is concerned. Makeever Bros., of New York, are promoting the El Mirador Mining Co., with a capital of \$2,500,000. Of the stock of this company \$1,000,000 will be put into the treasury of the San Pablo Mining Co., another concern promoted by the Makeever Bros. The El Mirador Mining Co. will own the Mirador and San Francisco groups of mines, some of which were recently purchased from M. E. MacDonald, of Guanajuato. These mines lie north of the Santiago river, slightly west of the Bolaños. There are several 'antiguas' in the group. Sanford Makeever has recently been at the properties making arrangements for the beginning of operations. Air-compressors and drills are to be purchased and erected for the purpose of pushing ahead the development as fast as possible. The motive power to be used is to be steam, until the Chapala Hydro-Electric Co. extends its power-lines into the district.

The good showing made on the Tajo Mining Co.'s property with a 10-stamp mill has been sufficient to make the management decide to triple the plant next year, and to build an aerial tramway from the mines to the mill, a distance of 2600 ft. These mines are in the San Sebastian district of Jalisco. In the Ayutla district of Jalisco, the Los Aliles Mining Co. has found a rich body of copper ore on the Aguacate vein, and arrangements are being made to ship the ore to a smelter. Harry T. Curran is manager at the mines. The Chapala Hydro-Electric Co. is building its transmission lines north to the Hostotipaquillo district as fast as possible. The company is constructing an average of over one kilometre daily. The transmission lines are supported on iron towers 200 metres apart. The main distributing station will be at Hostotipaquillo, near the El Favor mine. A branch line will also be built to supply the Southern Pacific company with power for the tunnel work on the Tepic-Jalisco boundary. The Etzatlan mining district will also have a main distributing station.

There seems to be some possibility that Richard Honey, who is now backing the construction of the Pachuca-Zimapan railroad, will finance the concession held by the National Railroad of Mexico to build the line on to Tampico. This is known as the Tampico short line. Eighty kilometres of the roadbed were constructed from Tampico southward, but suspended about a year and a half ago. If Richard Honey and associates take up this work it will connect with the Zimapan-Pachuca line. The estimated cost of the line is \$17,000,000, for the Tampico extension.

This line would not only open up the Zimapan district, but would give a new outlet from Pachuca to the sea.

One of the very important companies operating in the Concordia district of Sinaloa is the Panuco Mining Co., a local concern, with headquarters at Mazatlán. They have been operating since 1877, and in the past 25 years have paid nearly \$10,000,000 in dividends. They are at present distributing an average of \$50,000 per month. The company can, therefore, be classed as one of the most prosperous in Sinaloa. The Butters Copala 40-stamp mill, which was started several months ago, has been averaging 250 tons per day, and it is the intention of the managers to steadily increase the output until 400 tons per day is reached, which is the full capacity of the mill.

The Cia. Minera La Natividad, of Oaxaca, has tried a novel method of closing some roads that crossed their property. They placed wire fences around the property and connected these up with a moderate potential electric generator, with the result that anyone interfering with the fences, or attempting to cross them, received a shock. This resulted in causing more trouble than the roads, as several dogs were killed, and the Indians protested to the Governor,



Part of Oaxaca, Mexico.

who is causing an investigation to be made. Two new American corporations have recently been formed for the purpose of entering the mining field of Taviche, Oaxaca. They are operating under the title of the Elisea Gold & Silver Mining Co. and the Two Brothers Mining Co. They hold options on several properties in the district. Oaxaca, the capital of the State of the same name, is to have modern water-works and a drainage-system. All of the plans are ready, but none of the material has been contracted for, as yet. The plant will consist of a large reservoir, with a capacity of 2,000,000 cubic metres, to be constructed at an elevation of 500 ft. above the city in the hills to the north. The supply is to be brought from Vista Hermosa, about 30 kilometres north of Oaxaca. The Teziutlán Copper Mining & Smelting Co. has had the good fortune to strike an entirely new vein in the new shaft, being sunk on the Ocotés claim. This is a copper property, but the new vein yields gold-silver ore, with hardly any copper. When the new railroad is completed to Taviche it will be possible to ship ores to the smelters, and in view of this, and of the development of high-grade shipping ores in the various Oaxaca

camps, F. R. Brown, representing the Aguascalientes smelter, has been making a tour of inspection, and has advised the company to establish a purchasing agency there. The Guebeshe mine, in the Ocotlán district of Oaxaca, has just struck a body of high-grade gold-bearing ore. Onyx mining in Oaxaca is assuming the proportions of an important industry. A. G. Hamm is in charge of the extensive development work being carried on at the onyx quarries at Etla. Further deep exploration work will be undertaken with a core-drill, that has just been secured. E. M. Lawton, the United States consular agent in Oaxaca, recently purchased some onyx properties and under his direction development has been begun and has already shown up a 30-ft. bank of green onyx. The deposit is from 6 to 8 ft. thick, and it is estimated that about 100 tons of available onyx is developed for every 5 ft. of advance. Core-drills are to be purchased and further deep prospecting is to be undertaken under the directions of Ingle Carpenter who has considerable experience in onyx work. It is stated that the San Juan mine in Oaxaca has been offered to J. H. Costello, of Buffalo, for \$500,000 as it stands, and if he refuses it at that price, it will be again offered to Denny Bros. on bond, subject to further development work, which it is said Denny Bros. are willing to carry on at their own expense. The Boston & Oaxaca Mining Co., owning the El Placer mine and mill, situated between Tlacolula and Oaxaca, has been in a state of internal dissension and trouble for some time, which ultimately resulted in forcing the company into the hands of a receiver. The property was



A Glimpse of Pachuca.

put up for auction at Pierre, South Dakota, and was bought in by Arthur P. Teele, for \$20,100. Teele is said to represent the Barnes-Cummings faction of the directors of the old company. Arrangements are being made to protect the shareholders who paid actual cash for their shares in the old company. The new combination will be freed from about 500,000 shares of promotion stock. Development is now to be pushed on the property.

A company has been incorporated in Zacatecas under the title of the Chalchihuites Mining Co. for working the Florencia, Ampliación de Milagros, and Felipe mines, all of which are in the Chalchihuites district, close to the Conjuro property. The incorporators and officers are: Milton R. Straight, president, New York City; Francis E. Agnew, vice-president, Chalchihuites; Cyrus A. Phelps, secretary, San José de Ranchos. The ore is silver-gold and the veins are partly opened. The building for the mill being erected by the Compañía Beneficiadora de Metales y Minerales de Zacatecas, is nearly completed. Machinery is arriving and the plant will soon be in running order. It will include concentration and cyanide plants. The company will undertake custom milling. The company was floated by native promoters and the State Government subscribed one-fifth of the stock. Engineer Velasco Peña is personally in charge of construction work.

The Allis-Chalmers Co. has seen fit to quote the Cia. Beneficiadora de San Francisco y Pachuca, for Pachuca tanks to be built in the United States, without regard to

patent rights in Mexico, and have guaranteed immunity against claims for royalty or damages. This means that the Allis-Chalmers Co. considers the patent invalid, and in regard to this it is an interesting fact that a conical type of tank with air agitation was illustrated in a catalogue dated 1905 of the Colorado Iron Works, which is prior to the date on which the patents were issued in Mexico. Francis E. Pratt, representative of the Hammond Iron Works, of Warren, Pennsylvania, has made application for a concession covering a period of ten years, for the exclusive right to manufacture iron tanks, pipes, and heavy sheet-steel work of all kinds, for mining, railroad, oil, and other industrial purposes, in the Republic of Mexico, and as there is practically no opposition it looks as though the concession would be granted. The invalidity of the MacArthur-Forrest patents was determined by the Mexican courts some time ago, and if cheap tanks and the termination of royalties, both come at the same time, there should be an increase in the number of cyanide plants.

WASHINGTON.

Secretary of the Interior on Reclamation.—Permissible Explosives.—

Arsenic and Bismuth Production.—Patents.—Panama Progress.

Richard A. Ballinger, Secretary of the Interior, has returned to Washington after an extended tour of the West. In a statement to the press he declared again that since his incumbency no water-power sites on the public domain have been secured by private parties, and that he has energetically made every effort, by temporary withdrawals, to segregate existing power-sites on the public domain, in order to enable Congress to legislate for their more prudent disposition. Respecting the reclamation work, the Secretary says the trip has inspired him with the ambition to complete existing projects as rapidly as business prudence and money available will permit, and he is earnestly in favor of securing authority from Congress for the issuance of bonds against the Reclamation fund, to give the service the means whereby all existing projects can be speedily completed and necessary extensions taken. He was emphatic in his commendation of the personnel of the service and of the high type of construction for which they are responsible. In his annual report, the Secretary will place special emphasis upon the right use and disposition of the coal, phosphate, oil, and other mineral deposits. The activities of his department, the Secretary says, will show an aggressive and untiring effort to prevent the illegal and improper disposition of the public domain.

Explosives Circular No. 2, dealing with permissible explosives for use in coal mines, has just been issued by the United States Geological Survey. Altogether 31 explosives have passed the test at the testing station at Pittsburgh, Pennsylvania. So far, three coal mining States, Pennsylvania, West Virginia, and Alabama, have adopted the use of these permissible explosives in gassy mines. In Pennsylvania there is a little difficulty. The miners in the Pittsburgh district claim that the 'permissible explosives' make more fine coal than the black powder, and that their earnings are thereby affected. Many of the miners expressed themselves as satisfied with the use of black blasting powder. Some of them doubted that explosions were ever caused by coal dust. Mr. Tom Lewis, president of the United Mine Workers of America, has been in Pittsburgh attempting to settle the dispute, and he suggested a visit to the Government experiment plant. This was arranged, and before the men left the plant, all had a vivid idea of the force of a coal-dust explosion ignited by black powder. What makes the dispute between the miners and operators difficult to settle is the fact that the operators have let contracts for their coal based upon the scale of wages agreed upon before the question of permissible explosives arose.

During 1908, according to F. L. Hess, of the U. S. Geological Survey, arsenic was produced in a commercial way at only two places in the United States—Everett, Washington, where the American Smelters Securities Co. has a plant, and at the Washoe smelter, Anaconda, Montana. The product was in the form of white arsenic (arsenic trioxide), and was derived largely from flue-dust. If even one-half

the arsenic that passes up the flues of the Washoe smelter could be saved, that plant would more than supply the whole demand in this country for arsenic and its compounds. The United States has been a small producer of bismuth ores, and until the last two years these ores have been shipped abroad for reduction, but plants at St. Louis, Missouri, and Grasse, Indiana, are now recovering bismuth from lead ores. Bismuth is contained also in ores of other metals than lead, but most of it that is now mined passes unrecovered out of the smelter flues. It is estimated that 880 lb. of bismuth are thrown off every day in the smoke and gases of the Washoe smelter.

A. Platt Andrew, the new Director of the Mint, has arrived in Washington to take up his new duties. He has been abroad with Nelson W. Aldrich, Senator from Rhode Island, studying the financial situation in connection with the monetary commission, and will go West with Mr. Aldrich to try to educate the Western States up to acquiescence in Mr. Aldrich's plan of currency legislation. The Patent Office here in Washington shows that 900,000 patents have been issued to citizens of the United States since the creation of this office. More than 2,000,000 foreign patents have been recorded here. During the year 1908, 35,000 patents were issued. The grand total of receipts over expenses in the Patent Office since its establishment is \$7,060,547. During the month of September, 2,771,245 cu. yd. were excavated in the construction of the Panama Canal; 420 tons of explosives were used; 19,417 men were employed.

GOLDFIELD, NEVADA.

Ore Production.—Consolidated Mines Ore Reserves. — Red Top. — Florence Output.—Combination Fraction.

Ore production is maintained at a figure slightly above \$200,000 per week in the Goldfield district. This is below normal, owing to the abandonment of the Combination mill, a portion of which was demolished by the caving of the Hampton stope, and the suspension of operations on the Goldfield Daisy. Within less than 90 days the output will be increased by the installation of Chilean mills in the Consolidated company's 100-stamp mill, increasing the capacity of that plant to a minimum of 850 tons per day, and at least three leases in inside territory, on which deep shafts are being sunk near proved orebodies, should, from present indications, be sending ore to the samplers. The report of the State bullion-tax agent, just issued, for the first six months of the present year, shows that Esmeralda county produced nearly five-sixths of the mineral value of the State, and that the Goldfield Consolidated Mines Co. paid a larger sum in bullion-tax than all other mining enterprises in the State combined. The gross production of Nevada for the first six months of 1909 is \$13,234,692, as against \$5,838,161 for the corresponding period in 1908, and the bullion-tax paid for this period was \$121,512, as against \$45,519 for the same time last year.

An examination of the mine workings and office records of the Consolidated Mines Co. shows that the ore reserves have been materially augmented during the past few months, and by far the most valuable development in the mine is the opening at the 600, 730, and 860-ft. levels of the Mohawk-Jumbo ore-shoot, which is now conceded to be superior even to the Hampton vein of the Combination. The accuracy of the figures and assay values quoted is confirmed by H. P. Henderson, general superintendent. At the 1000-ft. level of the Clermont progress has been slower owing to the character of the ground and the heavy flow of water, but the sump is 50 ft. below this level, and a high-power electric station-pump has eliminated this difficulty. The west cross-cut is being driven rapidly, though it is not expected that the vein will be reached for over a month. The 860-ft. cross-cut passed through the vein diagonally, showing 20 ft. of high-grade milling ore accompanied by seams of richer material, and the drifts both ways have opened the vein for over 260 ft., all in ore. The trend of the vein at this depth is the same as that shown above, namely, northeastward, with marked uniformity of wall.

The most notable development is at the 730-ft. level from the Clermont, where the cross-cut became a drift in ore for over 250 ft., and at the point where the vein was cut through, the samplings of the face of the cut for 27 ft. across the vein assayed from \$500 to \$2200 per ton. At this point a raise was started to the 600-ft. level, but the entire mass of the ore was of such richness that the raise was abandoned, and work started in material of lower grade in order to break ore nearer in value to the desired grade for treatment in the mill. One raise has already been completed from the 730 to the 600-ft. level, and is all in good ore. The vein has been followed 60 ft. farther, and for the entire distance shows large quantities of high-grade ore. Within a month another raise will be started to meet the drifts from the bottom of a winze sunk 50 ft. below the sill-floors of the great stopes at the southeast corner of the Mohawk, extending into the Jumbo, which are opened between the 450 and 600-ft. levels. Large bodies of high-grade ore are being developed in ground adjoining the long cross-cut connecting the Mohawk and Clermont shafts at the 600-ft. level. This cross-cut was driven in a direct line from the Mohawk workings to secure air-connection and without regard to the position of orebodies, and for over 300 ft. east of the Mohawk workings it passes through quartz, after which it enters the country rock. A large production is being made from the big southeast stopes of the Mohawk, and excellent ore is being opened in drifts from the winze, 50 ft. deeper. The northwest lateral from the Clermont at the 600-ft. level has entered the Red Top vein on the Lucky Boy claim, and drifts are following the ore both ways. The vein was cut at the point where it turns sharply to the west and below the best stopes in the Red Top vein. After its turn to the west this vein apparently becomes a part of the Mohawk, both being, in point of fact, parts of one great vein system, but there is a short interval where the ore is not proved at the junction of the two main veins, and where a large fault has caused a break in the continuity of the ore, which, however, extends to the fault-planes on either side.

A steady production is being made from the long series of stopes in the Red Top vein north and south at the 260-ft. level, and the vein is being opened extensively at the 330-ft. level. Pay-ore has now been opened in this vein almost continuously for a distance of 1600 ft. north and south, and the Red Top drift north has connected with the stopes of of the former Consolidated Red Top lease, and has exposed high-grade ore within a few feet of the lease workings. Ore of excellent quality is being taken from the Combination mine, and the caving of the Hampton stope will cause but little interruption in ore extraction. The superintendent says it is still uncertain how much of the caved material can be treated profitably, as a large part of this is country rock from the hanging wall. A force of miners is still engaged seeking the bodies of the two men entombed by the falling ground above the big stope. At the south end of the Combination No. 1 and on the Combination No. 2, adjoining the old Reilly lease on the Florence, large stopes have been opened at the fourth level and are now being opened at the fifth. The work of 'glory-holing' this vein and opening it to the surface will be deferred until the additions to the mill shall have been completed, but raises will soon begin from the stopes below.

The Florence mine is producing, and the mill treating, nearly 160 tons per day, and the mill-heads are averaging between \$25 and \$30 per ton. Stopes are being opened at several points, but the principal production is still from development work, and a large part of the tonnage comes from the Little-Florence shaft, whence it is conveyed by aerial trolley to the mill-bins. One of the most important developments is at the fourth level near the former Gem Florence lease workings, where the ore is being stoped for a width of from 10 to 14 ft. between well defined walls, the entire orebody assaying from \$50 to \$100 per ton, with seams and pockets of rich telluride. There is now a large tonnage of high-grade ore exposed in the mine and blocked in readiness for extraction. Shipments can be made at short notice if desired. Other good orebodies are opened at the fourth level in the Engineers' vein, where the ore assays from \$60 to \$100.

General Mining News.

ARIZONA.

COCHISE COUNTY.

The Empire shaft, at Dragoon, is down over 100 ft., and has opened a 5-ft. vein. Colorado capitalists have secured a ten days' option on the property, of which Oliver Merrill is superintendent. Mr. Merrill and associates have located a group of claims three miles from Cochise and have taken a number of samples from the property, the average assay of which was 14 oz. silver, and \$16.50 gold per ton.—The Mabel Copper Co. is to install a compressor and power plant at its property in the Dragoon mountains, and will shortly commence work on a 1000-ft. adit that will open the orebody at depth.

GILA COUNTY.

The Superior & Boston Copper Co. has completed a station on the sixth level of the McGaw shaft, and is cross-cutting for the Great Eastern vein which is several hundred feet west of the shaft. On the 400-ft. level of the Gardner shaft the cross-cut is being driven to open the Black Oxide vein. The company is erecting a change house for the men north of the McGaw shaft that will be one of the best in the district when completed.—The Scorpion shaft of the Inspiration Copper Co. is down 150 ft. and is expected to cut the sulphide zone shortly. Both cross-cuts on the 400-ft. level of the Joe Bush shaft are in ore, the face averaging 3% copper. The company has completed 15 holes with two Keystone drills and is now erecting a number of cottages for its employees.—At the property of the Cole Development Co., near Gibson, the shaft in which work was resumed several weeks ago at a depth of 320 ft., is now down 340 ft., the bottom being in an ore that is chiefly chalcopryrite, and assays between 8 and 10% copper.—The new smelter of the Arizona Commercial Copper Co., which was blown-in October 15, is running successfully, treating 200 tons of ore per day. The supply is being drawn from the fifth and sixth levels of the company's property at Copper hill, and the Copper Bell mine. The station at the seventh level of the Eureka shaft has been completed and drifts started on the vein. A heavy Prescott station pump is to be installed on this level to handle the heavy flow of water during the wet season.—On the 200-ft. level of the Live Oak property, in the Miami district, the west cross-cut is in a concentrating ore that averages 2% copper, and on the 300-ft. level, the work has been extended over 360 ft., the present face being in 3% ore. At the Cordova property the cross-cut has been driven 40 ft. on the 475-ft. level. There is a fair showing of chalcocite in the face and the company expects to open a body of commercial grade within a short distance. M. E. McCarthy is manager of both properties.—Considerable surface work is being done at the Duquesne property, near Globe, to ascertain the best place to sink a vertical shaft, as the company plans the erection of a new surface plant. A number of recent shipments to the Old Dominion smelter recently averaged 2 oz. gold per ton. John F. Shaw is president of the company.

MOHAVE COUNTY.

The Union Basin Mining Co. shipped seven cars of zinc ore to the smelter that assayed 45% zinc.—A new tubemill has been installed at the Tom Reed mine at Oatman and the mortars are being set in position.—A wagon road has been completed to the Bethel mine, in Todd basin, which was recently taken over by L. D. Godshall and associates. There is a large outcrop on the property and it is the intention of the owners to sink a shaft to open the ore. The same parties have secured the controlling interest in the Oro Plata mine and it is reported that operations will be resumed at that property in a short time.—James H. Hurin, of Los Angeles, president of the Tennessee Mining Co., is now in Chloride examining the company's property with a view to unwatering the mine and resuming operations. The Tennessee mine, which is opened by a 600-ft. shaft and several thousand feet of drifts, though idle for the past two years, has produced in the aggregate more than

any mine in the Chloride district. The vein is from 6 to 12 ft. wide, and on the lowest level the last work opened a 300-ft. shoot.—In the Cottonwood district, eight miles from Hackberry, James Brown has cut 2 ft. of \$60 free-milling gold ore in the bottom of a 20-ft. shaft, and in the same vicinity McAbee & McBride have opened at a depth of 50 ft. 4 ft. of ore of the same character, 18 in. of which assays a little over \$60 per ton, the remainder being a good grade of milling ore.—In the Southwestern mine, at Copperville, 22 miles from Yucca, 4 ft. of ore has been found on the 300-ft. level. The ore contains chalcopryrite, gold, and silver, with the light quartz gangue. As a result of the new find, sinking will be resumed at once, and the shaft continued to the 500-ft. level.—A. C. Werden, representing Denver capitalists, has started sinking on the Paddy Mullen property, near Goldroad, which he bonded recently. Mr. Werden is also preparing to install machinery on the Red Creek group adjoining the Gold Road mine on the north.

YAVAPAI COUNTY.

The Thompson Syndicate, which has recently taken over the Leghorn group, in the Cherry Creek district, has let a contract to sink a 200-ft. shaft and drive 400 ft. on the vein. The property is to be equipped with a Lane mill, and new living quarters erected for the men.—The Mudhole mine, in the Walker district, operated by the Penn-Arizona Mining Co., has been unwatered and a new electric hoist erected at the shaft. The mill on the property has been repaired and will now be driven by electric power as connection has been made with the lines of the Arizona Power Co. A. E. Hurley is manager for the company.—There are several tons of rich ore on the dump of the Champion mine which John Edwards is operating on a lease.

CALIFORNIA.

KERN COUNTY.

The well of the St. Lawrence Oil Co., in the Midland district, struck a flow of light oil at a depth of 1760 ft.—The Santa Fe company, drilling in the same district, has brought in a well of light oil. The flow was so heavy at first that it was impossible to control it and several hundred barrels escaped before the well was capped.—A meeting of the stockholders of the Two-Step Oil Co. has been called for November 10 to organize the Walker Oil Co., which will take over the property of the Two-Step company in the Devil's Den district.

NAPA COUNTY.

The old Aetna quicksilver mine has been re-opened and 17 flasks of quicksilver shipped in the past three months. There is considerable ore blocked out in the mine, but only one small retort has been put in operation.

NEVADA COUNTY.

The Kenosha mill has been started on ore from the shoot



Vein From Head-Frame of Empire Shaft.

recently opened in the north drift on the 400-ft. level and sinking resumed in the shaft.—At the Idaho-Maryland the raise from the 600 to the 500-ft. level is opening some rich ore. The drift on the 500-ft. level is in a good milling ore

and a fair tonnage is being sent to the mill from the intermediate level above the 400.

PLACER COUNTY.

(Special Correspondence).—The Ophir district is taking on new life. Several deals of some importance have been recently made, and a number of properties that have lain idle for years, are to be re-opened, among these being the Hathaway, formerly one of the great producers of the county.—New machinery has been installed at the Crater, which is being worked by lessees, with good results.—It is reported that the Crandall mine has been purchased by Colorado capitalists, and will be further developed.—At Michigan Bluffs, W. S. Fletcher is preparing to resume work at the Home Ticket. This property was recently closed because of a strike of the miners, but the trouble has been adjusted.

Auburn, November 1.

RIVERSIDE COUNTY.

(Special Correspondence).—A large vein of free-milling ore assaying \$50 per ton has been opened at a depth of 100 ft. on the Bailey group.—Operations have been resumed at the Elder Morn and shipping will commence with the completion of the railroad.—At the Rapynco a 4-ft. vein, said to assay \$100 per ton in copper, gold, and silver, has been opened in the new adit. A station will be cut at this point and a shaft sunk on the vein.—At the Steece group a good reserve of ore has been opened assaying from \$10 to \$50 per ton. It is possible that a plant will be erected next year.—In the Whipple district activities are pronounced. A deal for the Hon is under way, and is expected to be concluded within a few days.—The D. & W. and others are showing good ore with increasing depth. Owing to lack of capital the properties in this district are operating on a restricted scale.

Calzona, October 30.

SIERRA COUNTY.

The drift at the Rainbow Extension mine in the Alleghany district opened a shoot of high-grade ore that will assay several thousand dollars per ton. The property is situated between the Rainbow and Twenty-One mines, and is thought to be on the same lead. The drift is now in 160 ft., and has been in the rich shoot for the last 20. A raise has been started and is now up 15 ft. O. A. Harlan is manager.—At the Gold Canyon mine considerable rich ore is being mined and the 10-stamp mill is running regularly. A new adit is to be started soon to open the ore at greater depth. R. H. Chase is superintendent.—M. H. Miller has secured an option on the Round Lake property of Dan Sullivan and Tony Lavezzola, and will commence work in the spring.—It is reported that operations will be resumed at the old California drift at Howland Flat.—At the Hilo gravel mine, on Chaparral hill, the Bernhardt Brothers are driving a raise to the surface for ventilation.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Shipments of milling ore are to be started next week from the Mammoth mine on Sherman mountain. B. J. Martelon, the manager, states that arrangements have been made with the operators of the Mendota mill to treat 25 tons of lead-zinc ore per day. The Argentine Exploration Co., operating this property, expects to start work on the construction of a concentrating plant within the next 60 days. The initial capacity is to be 25 tons per day.—The raise from the east drift on the Gambetta vein to connect with the old shaft workings was completed last Saturday. The entire 220 ft. being in lead-zinc ore that is from 8 to 20 in. wide. The zinc from this mine is the cleanest and highest grade found in the State, milling on an average of 56%. B. J. O'Connell, the manager, states that a compressor-plant will be purchased about January 1.—Another vein of lead-silver ore was cut last week on the Bellmont property, owned by the Empire Consolidated Mining Co., that assays 550 oz. silver per ton.—M. Bonham, owner of the North Star property, situated in East Argentine, has resumed work.—J. Eade has taken a lease upon a block of ground on the Wheeling vein.

Shipments of \$18 gold and silver-bearing ore are being made to the Waldorf mill.

Georgetown, October 30.

(Special Correspondence).—The Specie Payment mine in Virginia canyon, is shipping 50 tons per day, the return on which is 7 to 10 oz. gold per ton. A. M. Wells, of Denver, is manager.—All repairs at the Josephine mine, on Donaldson mountain, have been completed and the 100-ton mill started, the power being furnished by the Seaton Mountain Electric Co.—Shipments are to be started during the coming week from the holdings of the Philadelphia Mining Co., on Bellevue mountain. On the Boston vein a streak of lead ore has been followed for 400 ft. that is from a few inches to 2 ft. wide. The adit is to be continued for at least 1500 ft. to intersect the Grouse mines at depth. J. W. Boyd is manager.—The new Mixwell mill has been completed and will be started in a few days. The plant is constructed for amalgamation and concentration and is one of the most complete in the district. Philip Mixwell is manager.—H. I. Seemann, manager of the Lombard mines, states that work will be carried on throughout the winter months though, owing to lack of water, the 50-ton mill has been closed down for the season.—It is stated that within a short time work will be resumed in the advance of the Lucania adit, on Bellevue mountain. John McCall is manager.—The Stevenson lease, on the Little Mattie mine, on Chicago mountain, is proving one of the richest in this district. A body of ore is exposed in the stope that is from 8 to 20 in. wide, and the return on shipments has been 6.4 oz. gold and 37 oz. silver per ton.

Idaho Springs, October 29.

GILPIN COUNTY.

(Special Correspondence).—The shaft on the Chicago-Star property on Bobtail hill is to be sunk another 80 ft., making the total depth 800 ft. All work at the mine has been carried on by lessees, and the average return on the smelting ore varies from 2 to 3 oz. gold per ton. The mine is owned by Bruce Meyers, of Chicago.—A Rand compressor has been purchased by T. B. Bassett, who is operating the Baker mine through the La Crosse adit.—Preliminary work is under way on Fall river for the building of a large power plant during the coming year, the work on the dam and ditch being nearly completed.—Machinery has just been installed at the Rockford mine in Russell gulch, and the shaft will be sunk to the 240-ft. level, arrangements having been made to secure air from the Topeka power plant to operate machine-drills. This property was purchased a few months ago by H. P. Lowe and S. T. Harris.—The Golden Flint mine, at Perigo, was the scene of an important discovery a few days ago, a body of ore from 2 to 3 ft. wide having been uncovered that assays from \$17 to \$24 per ton. A 60-hp. boiler is to be installed.—The Aduddell mine, in Willis gulch, is to be started during the coming week. An examination of the workings shows that they have been drained by the Newhouse tunnel.—Operations have been resumed on the Gold Collar mine in Prosser gulch and grading is under way for a new 100-hp. boiler.—Frick, Taylor & Co., of Black Hawk, have resumed work upon their lease on the Milton mine. The shaft is being unwatered and will be sunk another 75 ft.—The property of the Jefferson-Calhoun Mining Co. was sold last week at sheriff's sale for \$35,000, while the holdings of the Calhoun T. & M. Co. were sold for \$20,000. The property was bid in by F. A. Williams, who serves as trustee, and it is reported that the holdings will shortly be redeemed.

Central City, October 26.

OURAY COUNTY.

The Revenue Tunnel Mines Co. has taken over its property in the Ouray district from the lessees and is operating it on company account. In the mill 30 of the 60 stamps are dropping on 100 tons of ore per day.—Operations have been resumed at the El Mahdi property which is under lease to F. H. Herzinger. A 300-ft. shaft has been sunk and several laterals run. A raise will be started on a streak of rich ore on the adit level and if the ore exposed warrants further work, the shaft will be cleaned out, and

work resumed there.—Fifty feet have been driven on the new level at the Chicago property and 150 sacks of rich ore stored on the dump. This property is under lease to Cripple Creek parties and is in charge of T. Crowley.

SUMMIT COUNTY.

The shaft at the Sallie Barber mine is to be sunk an additional 100 ft. and the ore blocked out on that level. The shipping ore at this property is mainly composed of zinc blende.—At the White Cloud property the mill is running on ore that averages \$18 per ton.—The Wellington property is shipping regularly and in a short time is to begin shipping concentrate to the sulphuric acid plant.

TELLER COUNTY.

The May Belle Leasing Co. has been organized to operate the May Belle property upon which it has secured a lease from the Victor Mines & Leasing Co. The company will install new machinery and open the mine from the 400-ft. shaft on the property.—The Elkton Consolidated Mining & Milling Co. distributed the regular bi-monthly dividend of 1c. per share and an extra dividend of 1/2c. per share, the total amount being \$37,500.—The Victor Consolidated Gold Mining Co. distributed the regular quarterly dividend of 3c. per share amounting to \$45,000.—The Union Leasing Co., operating on the 550-ft. level of the Husted shaft, opened a 4-ft. vein east of the shaft that assays between \$15 and \$50 per ton. The company is producing two cars of ore per day.—The Keener Gold Mining Co. has installed a new hoist and two 100-hp. boilers at its property on Battle mountain and is blocking out the ore preparatory to opening it for leasing.—The Colorado Mines Investment Co. shipped 30 tons of high-grade ore from the shoot recently opened on the eleventh level of the American Eagles mine which it is operating under lease.

IDAHO.

SHOSHONE COUNTY.

The Illinois Western Concentrating Co. has been organized to work over the tailing from the Morning mine at Mullan, and arrangements are under way for the installation of a mill in the creek-bed west of the property, the cost of which is estimated at not less than \$30,000. The project is being financed by a Chicago syndicate, the local representative being O. H. King.—The Alice Mining Co., operating between Wallace and Mullan, has completed arrangements to ship its first ore. The mill is working eight hours per day with good results and the development of the lower levels is progressing steadily.—It is announced that the old antimony mill, 15 miles east of Burke, which has been closed for 17 years, will resume operations in a short time. The property was opened by several adits, large bodies of antimony ore being exposed, and a smelting plant erected. This was not a success, however, and a new one will be installed.—The Bunker Hill & Sullivan company's new west mill, at Wardner, is to be in operation early this month. It has a capacity of 600 tons per day, and embraces all of the latest features in the thorough and economic handling of lead-silver ores. The power is derived from two motors of 200 and 250 hp., the current being supplied by the Washington Water Power Co., of Spokane. The east mill is to be partly shut down for repairs.—Grading for the new mill at the Black Horse mine, near Murray, is completed, and the machinery ordered, though it is not expected that the plant will be in operation before next spring. On the lower level the ore-shoot has been exposed for 200 ft., much of which is of a shipping grade, while the rest is good milling ore.—The mill at the Monarch mine, near Murray, which is being enlarged to 200 tons per day capacity, will be completed the latter part of this month. A long raise has been driven from the 800-ft. level to the surface and an excellent body of ore opened.

IDAHO COUNTY.

The Mines Company, Ltd., operating the Crackerjack property in the Buffalo Hump district, has secured control of 282 acres of patented ground adjoining its claims on a 50-year lease. A 3000-ft. aerial tram is under construction from the mine to mill and the company expects to have the plant in operation by the first of the year. The

management is making a number of experiments to determine as to the advisability of cyaniding the concentrate on the ground or to continue shipping it to the smelter.

NEZ PERCE COUNTY.

The cross-cut adit of the Ozark Mining Co., operating the Wild Rose mine in the Pierce district, intersected the vein at a vertical depth of 587 ft. A meeting of the stockholders is to be held at Pierce shortly to consider the advisability of continuing work throughout the winter and later erecting a mill on the property.

MISSOURI.

NEWTON COUNTY.

(Special Correspondence).—In the U. G. Wilson mine, in Spring City, a winze was sunk through a barren stratum and some rich ore found.—The Silver Dime Mining Co. has made a rich lead discovery on the O'Neil land east of Spurgeon. The ore occurs at 90 ft.—A new discovery resembling the early day silicate finds, was made by P. H. Crossman, west of Granby. The ore is high-grade and is found at a shallow depth.—The Mascot and Homestake, in the Granby camp, have gone below the usual level and opened a deposit of rich zinc blende at 235 ft. with a face 45 ft. high. The usual type of ore in this camp is silicate at a shallow level with considerable galena.—Many companies are at work in the Seneca camp in the southern part of the county.—The Lost Creek Co. has reached the best stage of development and is erecting a large plant. Silicate and galena predominate.

Seneca, October 30.

MONTANA.

LINCOLN COUNTY.

The Fisher Creek Mining & Smelting Co., which recently took over the Brick & Branagan properties on Fisher creek, 35 miles south of Libby, is to enlarge the 10-stamp mill and equip the mine with electric power. Arthur Goodwin is in charge of the work.

NEVADA.

ESMERALDA COUNTY.

Company work at the Daisy property has been entirely suspended, and most of the officers have tendered their resignations. John C. Kinnear will be in charge of the mine while the lessees continue operations.—A raise started from the 730-ft. level of the Consolidated ground to connect with the Clermont workings has opened a shoot of high-grade ore, and work at this point has been stopped and another raise started in a lower-grade ore to keep the product for the mill of even grade.—The Coming Nation Mining Co. has been re-organized and consolidated with the Eagle group as the Goldfield Consolidated East Extension group.

CLARK COUNTY.

(Special Correspondence).—The New Year's Gift has installed a new hoist and within a short time will be working from the winze below the 130-ft. level. The shipping ore will be sent to smelters, and the low-grade handled by the Chiquite mill, which is to be removed from Juniper to a site near the New York-Searchlight. Water will be obtained from the latter mine.—Lessees on the I X L have broken into a body of milling ore, though the extent of the vein is undetermined.—The New Year's Gift vein has been cut on the 600-ft. level of the Fraction property, but is very low-grade.—The shaft at the Searchlight Owl has reached a depth of 45 ft., cutting stringers of good ore at the 25 and 35-ft. points. The shaft is expected to intersect the Red Cliff vein at depth. A. J. Lawrence is superintendent.—The 40-ft. adit at the Colleen Bawn has cut a 3-ft. body of ore assaying \$40 per ton gold, silver, and lead. It will be driven 100 ft. farther, which will give nearly 150 ft. of stoping ground. Williams Reynolds is in charge.—A vein varying from 3 to 40 ft. in width and assaying from \$2 to \$20 per ton in gold and silver is being opened on the San Juan group. Eckerson & Miller report the striking of a 12-in. streak of ore assaying 200 oz. silver per ton, near Crescent.—Several companies are operating on turquoise properties at Crescent. The deposits are shallow, but many fine stones have been taken out.—At the C. & C. mine a

vein of self-fluxing ore containing gold, silver, copper, and lead is reported.—El Dorado canyon operators are constructing a wagon-road to this point to facilitate the shipment of machinery and supplies. The main shaft of the Lenape Gold & Copper Co. has struck a small flow of water at a depth of 290 ft. Cross-cutting will soon start from the 300-ft. point.—The Quartette Jr. will commence work on four claims adjoining the Quartette within a short time. T. J. Randall is manager.

Searchlight, October 29.

LINCOLN COUNTY.

The cross-cut on the 800-ft. level of the Mendha mine, in the Ploche district, opened a new orebody 325 ft. from the shaft. This is in territory that has never been prospected before so the extent of the discovery is unknown. On the 900-ft. level the winze is down 25 ft. on a 5-ft. vein that assays \$15 gold, 30 oz. silver, and 28% lead. John R. Cook is manager.—At the Black Vault mine the inclined shaft has opened some extremely rich ore, the average assaying over \$100 per ton in silver and lead. Alex Colbath is superintendent.—At the Consolidated Ploche properties the officers of the new company are planning the erection of a complete plant for the treatment of the lead-zinc-silver ore. It is expected that work will be started on this about the first of the year.

LYON COUNTY.

The 50-ft. shaft of Ross Thompson opened a body of chalcocite ore on his claims adjoining the Mason Valley

from the entrance. The inclined shaft on the Pettibone claim is down 36 ft. on the vein.—Several small transfers in placer properties at Manhattan have been recorded, Eastern people becoming interested.—In a battle between high-graders at the Stray Dog and a number of officers a few nights ago, Mr. Martinson, deputy sheriff, was wounded. The robbers descended to the 320-ft. level and were hard at work when detected. They escaped in the darkness, but it is believed that one of them was badly wounded.—Clothier & Gingles have uncovered a 12-in. streak of \$50 ore on Tramps Consolidated ground and the Kilker-O'Connor lease has opened milling ore.

Tonopah, October 23.

WHITE PINE COUNTY.

(Special Correspondence).—Driving has started from the 400-ft. level of the Brilliant shaft on Ely Consolidated to explore a cross-fissure recently intersected in the contact. Owing to the flooding of the lower levels no work is progressing below this point. The new vein is said to run 4% copper, \$5 gold per ton, with slight traces of silver. S. M. Levy is manager.—The raise from the 1000-ft. level in the new shaft at the Giroux is about 450 ft. from the surface. Progress has been at the rate of 150 ft. per month. The shaft is five-compartment and is in limestone. Concrete foundations for the new hoist are being placed in position.—The shaft at Boston-Ely has passed the 1000-ft. point and is going down rapidly. From the 600-ft. level it has been in the oxidized zone. Small streaks of copper are showing in the bottom of the shaft. E. W. Ralph is superintendent.—The fourth reverberatory at Smelter is in commission. This will enable the management to conduct repairs on one of the older furnaces without reducing the monthly output. The steam-shovels at Copper Flat continue to maintain a production of 10,000 tons.

Ely, October 27.

NEW MEXICO.

GRANT COUNTY.

Phelps, Dodge & Co. have purchased the properties of the Burro Mountain Copper Co., at Leopold, from Nathan Leopold, of Chicago. There are 1000 acres in the property which is traversed by several rich veins as well as containing a large low-grade porphyry deposit. From these ores some 12,000,000 or 15,000,000 lb. of copper has been smelted. It is the intention of the company to open the mine gradually to supplement the output from its other properties.

SIERRA COUNTY.

(Special Correspondence).—Sinking has been resumed at the United States Treasury mine and a cross-cut will be extended from the 200-ft. level to tap the main orebody. This is about 4 ft. wide and assays \$20 to \$30 per ton, the ore carrying considerable silver. The new plant of machinery has been installed. The Keystone has been taken under lease by B. L. Morrison, of Colorado Springs, and will be energetically developed. The vein outcrops on the surface for a considerable distance and varies from 4 to 12 ft. in width. Considerable ore has been opened by lessees who expect to maintain a production of 50 tons per day. The assays are from \$8 to \$12, with a small streak running as high as \$100 per ton.—The cross-cut on the Keepsake claim of the Great Republic has intersected the extension of the Keystone vein, which is 3 ft. wide at this point.

Chloride, October 30.

OREGON.

JOSEPHINE COUNTY.

The Oregon-California Consolidated Mines Co., with headquarters at Grants Pass, has installed hydraulic equipment at the former Briggs property near the Oregon-California State line, built living quarters for the men, and will work the placer ground of the group. The property has had a rather meteoric career, the outcrop of a rich vein being accidentally discovered by a hunter who sold the ground to



Searchlight, Nevada.

property.—Owing to the delay of a shipment of track bolts and spikes the progress of the Copper Belt railroad to Yerington has been somewhat delayed. A large amount of freight is stored at both terminals awaiting the completion of the road.

NYE COUNTY.

(Special Correspondence).—Approximately 6000 tons of ore are on the dumps of the West End company and 1000 more are stored in the stopes assaying about \$14 per ton. The company is negotiating for the steady treatment of its ore at a local plant.—The MacNamara is producing 500 tons of ore per week. Explorations are under way at the 800-ft. point, but no stoping is being done below the 200-ft. level. Gold ore has been opened on the 300.—The Dougherty lease on Jim Butler continues to ship steadily.—The Cooper & Nagle lease at Ellendale is said to have cut a 2-in. streak of \$500 ore at a depth of 50 ft. A larger vein of milling ore is being prospected.—With the exception of this discovery there has been little of interest at Ellendale since the first shipment, valued at \$27,000. Many of the first comers have departed for other points.—Work will be resumed at once on the Nevada company properties near Sodaville. The main orebody has been cut on the 800-ft. level of the Round Mountain mine, the ore assaying about \$10 per ton. The September production was \$34,000.—A 4-ft. vein running \$15 to \$20 per ton has been struck on the Haywood claim of the Buckeye Mining Co. at Manhattan. The find was made in the adit, 128 ft.

local capitalists for \$140,000, these in turn disposing of it to Eastern people, who a short time ago bonded the claims to the Oregon-California company. The company plans to erect a mill in the near future, as several adits which have been driven to cut the vein are all in good milling ore. The company has also secured properties near Gold Hill and Jacksonville. George W. Soranson will be in charge of the company's Western affairs.

PHILIPPINE ISLANDS.

The August yield of the Benguet Consolidated Mining Co. was \$5000 on the plates and \$3500 from the cyanide plant, the total product for the first seven months being approximately \$40,000.—In the Aroroy district the Tenco Mining Co. has opened a shoot of \$20 ore on the Mount Cogran company's property. There is a 10-stamp mill on the ground and this is to be re-modeled shortly and started as soon as the company has enough ore blocked out to keep it run-

cide to use it for dividends, it will amount to approximately 30c. per share.—E. C. Loose, of Provo, has obtained the controlling interest of the Ajax Mining Co., and the Golden Chain that adjoins it, and will consolidate the two properties, working them through the Ajax shaft.—The shaft at the East Tintic mine, in East Tintic, is down 515 ft., with a station cut and cross-cuts started on the 500-ft. level. The drift on the 330-ft. level is being advanced and the company is shipping three cars of ore per day from the 230-ft. level.—At the Provo, adjoining the East Tintic, the cross-cut opened ore thought to be the extension of the Tintic company's vein.—The drift on the 200-ft. level of the Grutil has opened several small bunches of ore and it is expected to tap the main orebody shortly.—The shaft of the Tintic Standard is now down 620 ft., and a contract has been let to sink it to the 800-ft. level. It is thought that at this depth the workings will be below the leached portion of the deposits.

SUMMIT COUNTY.

The cross-cut on the 1550-ft. level of the Silver King Consolidated property opened a rich stringer of silver-lead ore with some copper and gold. This ore was found in a fissure in the quartzite and a raise has been started to intersect the contact upon which the main orebody is supposed to be. This is the only high-grade ore found at this depth in the district, and upon the showing, the company has installed a skip in the winze on the 1100-ft. level, increased the working force, and is to open a new level below the 1550.—A number of stockholders of the Scott Hill Mining Co. visited the property between Alta and Park City and have decided to drive an adit 200 ft. below the lowest workings in the mine to prospect the ground and facilitate the handling of the ore. The Scott Hill is the old Copper Apex mine from which considerable ore has been shipped in the past.

TOOELE COUNTY.

The International Smelting & Refining Co. has 600 men at work re-modeling the old Highland Boy smelter, in Pine canyon, and expects to have the plant in commission shortly after the first of the year. Sixteen McDougall furnaces have been erected and the smoke stack, which is to be 340 ft. high, is up 50 ft. The plant will treat custom ores and as a result there has been a revival of interest in the mining industry of the Ophir and Stockton districts.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The hearing of the case of the Old Republic Mining Co. v. The New Republic Co. in the Federal Court, at Spokane, was compromised by the attorneys recently, and it was agreed that the New Republic Co. should work the mine and deposit the net earnings with the Ferry county treasurer pending the hearing of the suit for a permanent injunction. Work has been resumed in the mine, and about 80 men are on the pay-roll.—The Lone Pine lease is now a success, the shoot yielding ore which assays from \$17 to \$300 per ton.—The Ben Hur mine, after a considerable outlay, is paying more than expenses now that it is leased to the Ben Hur Leasing Co., which has discovered rich ore at a depth of 275 ft. This company has obtained an extension of its lease for three years, making in all a five years term. It is also in the market for a new steam-hoist, 80-hp. boiler, and an air-compressor, to run 10 machine-drills, of which 3 are now in commission and 7 more are to be added shortly. The leasing company has planned to sink the shaft to a depth of 625 ft. and open the mine on three more levels. Water sufficient for present use is taken from the mine, but an extra supply will be obtained by piping from Mud lake, about 2000 ft. distant.—The Belcher mine is sending out four carloads of ore per day to the Granby smelter. A new orebody has been found, in which lead is present with the iron.—It is reported that operations will be resumed in a few days in the Copper Key mine, on Belcher mountain, and carried on more extensively than before.—A new body of ore has been found in the No. 36 shaft of the Oversight mine, at a depth of 80 ft. The shaft was sunk 40 ft, through iron carbonate and sulphide and then cut



Philippine Islands.

ning.—The Aroroy Mining Co. has been incorporated to open the Goldbug group formerly owned by Edelmaler & Beasley.—A new hoist has been installed by the Cripple Creek Mining Co. on its Colorado group. T. A. Draper is in charge of the work.

UTAH.

JUAB COUNTY.

After ten years of litigation the Supreme Court rendered a decision in favor of the Grand Central Mining Co. against the Mammoth Mining Co. and the Mammoth company paid \$30,000 of the \$176,385 which the court found against it. While the amount of money involved in the suit was large, the main factor in the case was the ownership of several large orebodies upon which all work had been stopped by injunctions from the courts. It has not been decided whether the money will be paid out as dividends or used for further development work, but should the directors de-

through a bed of limestone before the discovery was made.

—Work has been resumed at the Anonymous mine.

Republic, October 30.

OKANOGAN COUNTY.

The Molson Gold Mining Co., operating the Poland China property, northwest of Chesaw, has called a special meeting of its stockholders for December 13 to vote on an increase in the capital stock to 4,000,000 shares. R. I. Plomert, formerly with the C. M. Fassett Co., of Spokane, is now at the property planning an extensive development and exploration campaign from the shaft on the 100-ft. level.

STEVENS COUNTY.

John A. Wilson, of Spokane, and O. M. Matthews, of Northport, have obtained control of the Paragon property, seven miles east of Northport, and will begin active development at once on two well defined shoots of high-grade ore.

CANADA.

BRITISH COLUMBIA.

An arrangement has been reached between the employees of the former Dominion company and the New Dominion company, whereby the men will receive 75% of the wages due them from the former company, and work has been resumed in the Rawhide mine, though it is probable that the Brooklyn and Idaho properties will be idle for some time. A new crusher will be installed in the plant and the ore crushed before going to the plant of the British Columbia Copper Co.—For the week ending October 27 the Granby company shipped over 27,000 tons of ore to the smelter at Trail. The eight furnaces now have a capacity of 4000 tons per day, and the shipments from the mines can easily supply this, as on the record day 5000 tons were hauled to the plant.—Charles Dempster, of New York, has given up his bond on the Hattie Brown property, as the owners insisted that cash payments be made, and so far as the development had shown, this was not warranted.

ONTARIO.

That the Government was satisfied with the prices obtained at the sale of the Gillies Limit is evinced by the fact that 1188 acres additional, south of the lots previously sold, has been placed on the market. This makes a total of 2100 acres offered for sale by the Government out of 64,000 acres contained in the Limit.—Power from the Ragged Chutes plant was made available for the Colonial and King Edward mills at Cross Lake, and operations have been resumed at both plants. The King Edward has been completely re-modeled.—The Cobalt Twins Silver Mining Co. has installed a diamond-drill and will prospect the vein to considerable depth before any further work is done in the shaft.

MEXICO.

CHIHUAHUA.

The new manager for the Lluvia de Oro Mining Co., H. R. Conklin, has purchased a hydro-electric power plant for installation on the Fuerte river. A dam will be built across the river to secure a 40-ft. head and the plant will transmit power five miles to the mill. The latter was started last month after great difficulties in landing the material at the mine. None of the machinery was sectionalized.

OAXACA.

The old Guadalupe mine, in the Sierra Juarez district, has been re-opened, and in the course of development, sufficient rich ore was found to pay for all current expenses by treatment with an arrastre. This ground is close to the Natividad mine and is being developed by J. L. Grandison and A. Buttner, of Oaxaca.—The option held by Denny Brothers on the San Juan property has expired and the owners, Juan Baight, Jesus Acevedo, and Lic. Cervantes, have refused an extension of time.

TEPIC.

The Zapote Mining Co. has begun the erection of a reduction plant on its property near Eliseo, and expects to have it in operation before the end of this year. The mill will consist of five stamps, a tube-mill and cyanide tanks, and will be operated by water power.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

E. C. HARDER was in San Francisco this week.

W. C. MENDENHALL has returned from Hawaii.

COREY C. BRAYTON is in South Dakota examining properties.

C. L. CONSTANT, JR., has just returned to New York from Cobalt.

F. K. BORROW has returned from Manchuria and is now in London.

E. A. HOLBROOK, of British Columbia, has been in San Francisco.

O. H. PACKER has gone to Washington, Sierra county, California.

J. M. CALLOW has returned to Salt Lake from the Hawaiian Islands.

GEORGE S. TYLER has returned from Rawhide, Nevada, to Oakland, California.

L. N. B. BULLOCK passed through London on his way from Mexico to West Africa.

R. S. RAINSFORD, who has been recuperating in Scotland, has now returned to California.

D. E. McPHERSON has opened an office in the Hooper Bdg., Salt Lake City, Utah.

H. D. BRUNING and C. B. NIMS, mining and civil engineers, have opened an office at Seattle.

FREDERICK H. MINARD has returned to Denver from an extended trip to Central America.

J. E. SPURR visited the Monte Cristo district, in the Cascade range, Washington, last week.

J. J. BENNETT, of DeLamar, Idaho, has been visiting the Comstock, and is now at Austin, Nevada.

J. R. WOLFE, of Portland, is superintendent of the Grey Eagle mine and mill near Gold Hill, Oregon.

C. W. MERRILL, of San Francisco, was recently at the Nickel Plate mine, Hedley, British Columbia.

ROBERT ALLEN, lately at Parral, Mexico, sailed from London for South Africa on October 16.

FRANCIS W. SEWELL has resigned as metallurgist to the British-Mexican Development Co. of London and Mexico.

JAMES A. BARR, of Seattle, has gone to Silverton, Colorado, to take a position with the Intersection M. & M. Company.

S. F. BRETHERTON has returned from Lodi, Nevada, where he started the lead smelter of the Lodi Mines Company.

J. CLARK, of Bisbee, Arizona, has been appointed general manager for the Mammoth Copper Co. at Kennett, California.

ELMER A. HOLBROOK has resigned as superintendent for the Daly Reduction Co., Ltd., and is at Fitchburg, Massachusetts.

FRED T. WILLIAMS is examining the mines of the Mount Wilson Gold & Silver M. Co., at Newmire, Colorado, for Eastern interests.

HERMAN KELLER, of New York, is to make a professional visit to Los Angeles and other points in the Southwest the latter part of October.

A. S. HASKELL, general manager for the Mammoth Copper Co. at Kennett, has resigned and will hereafter make his home in San Francisco.

ERNEST A. HAGGOTT is at the mines of the Yuma Copper Co., Vicksburg, Arizona. He will examine properties in Pinal county before returning to Los Angeles.

C. R. MORRIS has resigned as superintendent at the Monaldo mine, Masonic, California, to accept a similar position with the Pittsburg-Liberty Mining Company.

F. T. HAVARD has been appointed assistant professor of mining and metallurgy at the University of Wisconsin. Mr. Havard is a graduate of the Royal School of Mines, Freiberg, and has had metallurgical experience in Germany, Chile, Montana, and elsewhere.

MARKET REPORTS.

LOCAL METAL PRICES.

San Francisco, November 3.

| | | | |
|--------------------------|------------|--------------------------|---------|
| Antimony | 12-12½c | Quicksilver (flask)..... | 47½-48½ |
| Electrolytic Copper..... | 15¼-16½c | Spelter | 7½-8¼c |
| Pig Lead..... | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver per oz |
|--------------|-------------------------|-------|----------|------------------|
| Oct. 29..... | 12.58 | 4.23 | 6.40 | 50¼ |
| " 30..... | 12.68 | 4.23 | 6.40 | 50 |
| " 31..... | Sunday. No market. | | | |
| Nov. 1..... | 12.68 | 4.23 | 6.40 | 50¼ |
| " 2..... | 12.75 | 4.25 | 6.40 | |
| " 3..... | 12.78 | 4.25 | 6.40 | 50½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Oct. 28. | Nov. 3. |
|------------------------|----------|---------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 8 6 | 1 9 0 |
| El Oro..... | 1 6 0 | 1 6 0 |
| Esperanza..... | 2 17 6 | 3 0 0 |
| Dolores..... | 1 8 9 | 1 8 9 |
| Oroville Dredging..... | 0 11 9 | 0 11 9 |
| Mexico Mines..... | 6 6 3 | 6 8 9 |
| Tomboy..... | 0 19 4½ | 0 19 6 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. | | Closing prices. | |
|-------------------------|-----|---------------------------|-----|
| November 3. | | November 3. | |
| Amalgamated Copper..... | 87½ | Miami Copper..... | 16½ |
| A. S. & R. Co..... | 99½ | Mines Co. of America..... | ¾ |
| Boston Copper..... | 14½ | Montgomery-Shoshone..... | ¾ |
| B. C. Copper Co..... | 7 | Nevada Con..... | 29½ |
| Butte Coalition..... | 29½ | Nevada Utah..... | 1¼ |
| Cumberland-Ely..... | 7½ | Newhouse..... | 3½ |
| Davis-Daly..... | 5½ | Nipissing..... | 10¾ |
| Dolores..... | 7½ | Ohio Copper..... | 4½ |
| El Rayo..... | 2½ | Ray Central..... | 2½ |
| Ely Central..... | 3½ | Ray Con..... | 18½ |
| First National..... | 6½ | Superior & Pittsburg..... | 16½ |
| Giroux..... | 9½ | Tenn. Copper..... | 30½ |
| Guanajuato Con..... | 1½ | Trinity..... | 10½ |
| Inspiration..... | 7½ | Tuolumne Copper..... | 3½ |
| Kerr Lake..... | 8½ | United Copper..... | 7½ |
| La Rose..... | 4½ | Utah Copper..... | 50½ |
| Mason Valley..... | 1½ | Yukon Gold..... | 4½ |

COPPER SHARES—BOSTON.

Closing Prices.

November 3.

| Closing Prices. | | Closing Prices. | |
|-------------------------|-----|---------------------------|-----|
| November 3. | | November 3. | |
| Adventure..... | 4¼ | Mass Copper..... | 6 |
| Allouez..... | 58 | Mayflower..... | 50 |
| Apex..... | 4¼ | Mexican Con..... | 5 |
| Arcadian..... | 4¼ | Michigan..... | 6¼ |
| Arizona Commercial..... | 45½ | Mohawk..... | 60 |
| Atlantic..... | 11 | North Butte..... | 68½ |
| Black Mountain..... | 65 | Old Dominion..... | 62 |
| Boston Con..... | 14½ | Osceola..... | 118 |
| Butte & London..... | 23 | Parrot..... | 28½ |
| Cactus..... | 3¼ | Quincy..... | 57 |
| Calumet & Arizona..... | 100 | Raven..... | 85 |
| Calumet & Hecla..... | 666 | San Antonio..... | 7½ |
| Centennial..... | 28½ | Santa Fe..... | 1¼ |
| Chemung..... | 17½ | Shannon..... | 15½ |
| Con. Mercur..... | 15 | Superior Copper..... | 58¼ |
| Copper Range..... | 80½ | Superior & Boston..... | 13½ |
| Corbin..... | 20½ | Superior & Pittsburg..... | 16½ |
| Daly-West..... | 7¼ | Tamarack..... | 65 |
| East Butte..... | 10¼ | Trinity..... | 11¼ |
| Elm River..... | 1¼ | U. S. Smelting..... | 54¼ |
| Franklin..... | 16½ | U. S. Pref'd..... | 52¼ |
| Granby..... | 98 | Utah Con..... | 43½ |
| Greene-Canaan, etc..... | 11¼ | Victoria..... | 8 |
| Hancock..... | 11 | Winona..... | 7 |
| Helvetia..... | 6¼ | Wolverine..... | 10 |
| Majestic..... | 96 | Wyandot..... | 2¼ |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, November 3.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 12 | Midway..... | \$ 16 |
| Belmont..... | 70 | Montana Tonopah..... | 80 |
| Booth..... | 11 | Nevada Hills..... | 70 |
| Columbia Mtn..... | 8 | Ophir (Comstock)..... | 1.70 |
| Combination Fraction..... | 65 | Pittsburg Silver Peak..... | 60 |
| Daly..... | 7 | Rawhide Coalition..... | 30 |
| Florence..... | 2.75 | Rawhide Queen..... | 30 |
| Goldfield Con..... | 7.15 | Round Mountain..... | 62 |
| Gold Keweenaw..... | 5 | Sandstorm..... | 8 |
| Great Bend..... | 6 | Silver Pick..... | 9 |
| Jim Butler..... | 12 | St. Ives..... | 10 |
| Jumbo Extension..... | 13 | Tonopah Extension..... | 51 |
| MacNamara..... | 27 | Tonopah of Nevada..... | 6.55 |
| Mayflower..... | 11 | West End..... | 22 |

(By courtesy of the San Francisco Stock & Exchange Board.)

COMSTOCKS.

San Francisco, November 3.

| | | | |
|----------------------|--------|----------------------|-------|
| Alpha..... | \$0.08 | Justice..... | 0.10 |
| Alta..... | 0.15 | Kentuck..... | 0.15 |
| Andes..... | 0.18 | Lady Washington..... | 0.15 |
| Belcher..... | 1.00 | Mexican..... | 1.25 |
| Best & Belcher..... | 0.52 | New York Con..... | 0.05 |
| Bullion..... | 0.28 | Occident..... | 0.25 |
| Caledonia..... | 0.32 | Ophir..... | 1.62½ |
| Challenge Con..... | 0.25 | Overman..... | 0.24 |
| Chollar..... | 0.16 | Potosi..... | 0.50 |
| Confidence..... | 1.25 | Savage..... | 0.38 |
| Con. Imperial..... | 0.05 | Scorpion..... | 0.12 |
| Con. Virginia..... | 1.00 | Seg. Belcher..... | 0.06 |
| Crown Point..... | 1.00 | Sierra Nevada..... | 0.45 |
| Exchequer..... | 0.20 | Silver Hill..... | 0.10 |
| Gould & Curry..... | 0.29 | Union..... | 0.64 |
| Hale & Norcross..... | 0.40 | Utah..... | 0.07 |
| Julia..... | 0.10 | Yellow Jacket..... | 0.95 |

OIL SHARES.

San Francisco, November 3.

| | | | |
|---------------------|---------|------------------|-------|
| Associated Oil..... | \$38.00 | Paraffine..... | 0.85 |
| Bay City..... | 0.90 | Premier..... | 0.50 |
| Blue Moon..... | 0.26 | Record..... | 4.00 |
| Caribou..... | 15.00 | S. F. & McK..... | 25.25 |
| Claremont..... | 2.12½ | Sauer Dough..... | 2.70 |
| Four..... | 0.28 | Section 25..... | 14.75 |
| Home..... | 0.80 | Sesnon..... | 8.00 |
| Illinois Crude..... | 0.50 | Shawmut..... | 0.40 |
| McKittrick..... | 0.09 | S. W. & B..... | 0.40 |
| Monte Cristo..... | 2.15 | Turner..... | 0.55 |
| Nevada County..... | 0.25 | W. K. Oil..... | 2.20 |

(By courtesy of the California Stock & Oil Exchange.)

MONTHLY STATEMENT OF DIVIDENDS PAID BY ACTIVE LISTED OIL COMPANIES TO OCTOBER 31, 1909.

| Company. | No. of Div. | Date paid | Amount per share. | Amount of dividend. | Total paid to date. |
|-------------------------|-------------|-----------|-------------------|---------------------|---------------------|
| Alma..... | 13 | Oct. '09 | \$0.03 | \$ 11,400.00 | \$ 148,200.00 |
| Amalgamated Oil..... | 26 | Sept. '09 | 1.00 | 50,000.00 | 1,300,000.00 |
| Amer. Petroleum..... | 4 | Aug. '09 | 1.47 | 147,952.52 | 450,711.50 |
| Apollo..... | 2 | Mar. '09 | .01 | 2,000.00 | 4,000.00 |
| Associated Oil Co..... | 4 | Mar. '07 | 1.50 | 446,055.00 | 1,548,368.55 |
| Bay City..... | 2 | Aug. '09 | .30 | 30,000.00 | 40,000.00 |
| Brookshire..... | 42 | Oct. '09 | .01 | 5,000.00 | 427,500.00 |
| Caribou..... | 54 | Oct. '09 | .25 | 20,175.75 | 599,652.99 |
| Chicago Crude..... | 2 | Mar. '07 | ¼c | 5,000.00 | 15,000.00 |
| Claremont..... | 53 | Oct. '09 | .02 | 9,000.00 | 269,000.00 |
| Coalinga Pacific..... | 17 | Oct. '09 | .10 | 6,500.00 | 100,750.00 |
| Columbia..... | 31 | Oct. '09 | ¼c | 4,996.31 | 234,826.39 |
| Del Rey..... | 3 | May '09 | ½c | 3,927.50 | 11,782.50 |
| Esperanza..... | 24 | Oct. '09 | .02 | 3,200.00 | 43,050.00 |
| Euclid..... | 32 | Oct. '09 | .01 | 3,500.00 | 106,500.00 |
| Four..... | 66 | Oct. '09 | .01 | 3,000.00 | 207,000.00 |
| Globe..... | 19 | Oct. '09 | .01 | 6,000.00 | 75,000.00 |
| Hanford..... | 30 | Jan. '06 | 2.00 | 4,000.00 | 80,000.00 |
| Home..... | A12 | Oct. '09 | .02 | 2,000.00 | 464,000.00 |
| Homestake..... | 43 | Oct. '09 | .10 | 1,000.00 | 75,250.00 |
| Illinois Crude..... | 32 | Oct. '09 | .01 | 2,000.00 | 78,000.00 |
| Imperial..... | 66 | Oct. '09 | .60 | 60,000.00 | 1,880,000.00 |
| Junction..... | 8 | June '09 | .01 | 2,500.00 | 20,000.00 |
| Kern Oil..... | 1 | Sept. '09 | .20 | 20,000.00 | 20,000.00 |
| Kern River..... | 39 | Feb. '09 | .10 | 2,000.00 | 98,000.00 |
| Linda Vista..... | 17 | Sept. '09 | .01 | 3,838.50 | 61,416.00 |
| Lucile..... | 14 | Sept. '09 | .10 | 2,670.44 | 37,386.16 |
| Mex. Petroleum..... | Oct. | '09 | .01¼ | 84,740.32 | 3,059,912.80 |
| Mecca..... | 6 | July '09 | .03 | 12,675.00 | 71,825.00 |
| Monte Cristo..... | 58 | Oct. '09 | .03 | 15,000.00 | 340,000.00 |
| Nevada County..... | 3 | Oct. '08 | .04 | 10,000.00 | 40,000.00 |
| Palmer..... | 5 | Oct. '09 | .01 | 18,020.05 | 160,260.65 |
| Peerless..... | 77 | Sept. '09 | .06 | 6,000.00 | 801,000.00 |
| Piedmont..... | 6 | Aug. '09 | .01 | 3,890.00 | 22,987.30 |
| Pinal..... | Oct. | '09 | .10 | 15,000.00 | 834,841.00 |
| Pittsburg..... | 10 | Nov. '07 | 2¼½ | 58,800.00 | 124,800.00 |
| Record..... | 4 | Oct. '09 | .05 | 5,000.00 | 20,000.00 |
| Reed Crude..... | 10 | July '09 | .05 | 5,000.00 | 1,112,000.00 |
| Rice Ranch..... | 13 | Oct. '09 | .01 | 3,000.00 | 84,000.00 |
| Royalty..... | 11 | Oct. '09 | .02 | 400.00 | 6,800.00 |
| S. F. & McKittrick..... | 18 | Oct. '09 | .50 | 25,000.00 | 265,000.00 |
| Sauer Dough..... | 44 | Oct. '09 | .05 | 9,975.00 | 438,900.00 |
| Sesnon..... | 3 | Oct. '09 | .15 | 15,000.00 | 45,000.00 |
| Silver Tip Oil Co..... | 1 | Oct. '09 | .10 | 7,500.00 | 7,500.00 |
| Sovereign..... | 16 | Oct. '09 | .01 | 5,000.00 | 85,000.00 |
| Sterling..... | 21 | Sept. '09 | .25 | 62,500.00 | 684,500.00 |
| Superior..... | 9 | July '09 | .01 | 5,000.00 | 45,000.00 |
| S. W. & B..... | 8 | Oct. '09 | .01 | 3,770.00 | 45,240.00 |
| Thirty Three..... | 58 | Sept. '09 | .30 | 30,000.00 | 670,000.00 |
| Traders..... | Oct. | '09 | 1.00 | 11,550.00 | 112,150.00 |
| Union..... | 154 | Oct. '09 | .50 | 124,813.00 | 5,744,190.15 |
| United Petroleum..... | 98 | Oct. '09 | .50 | 40,375.50 | 1,977,082.43 |
| Wabash..... | 22 | Oct. '09 | .01 | 3,000.00 | 105,000.00 |
| West Coast (pfd)..... | 2 | July '09 | 2.00 | 20,816.00 | 41,632.00 |
| Western Union..... | Dec. | '07 | 2.00 | 20,000.00 | 484,951.00 |
| West Shore..... | 47 | Dec. '08 | .05 | 5,000.00 | 235,000.00 |

Total dividends paid to date.....\$26,050,966.42

Permissible Explosives.

The following list of permissible explosives tested by the United States Geological Survey at Pittsburg, Pa., is hereby published for the benefit of operators, mine owners, mine inspectors, miners, and other interested. The conditions and test requirements described in Explosives Circular No. 1, published in the MINING AND SCIENTIFIC PRESS, June 5, have been followed in all subsequent tests. Subject to the provisions named below, a permissible explosive is defined as an explosive which is in such condition that the chemical and physical tests do not show any unfavorable results; which has passed gas and dust gallery tests No. 1 and 3, as described in circular No. 1; and of which, in test No. 4, 1½ lb. (680 gm.) has been fired into the mixture there described without causing ignition.

| Brand. | Manufacturers. |
|------------------------------|---|
| *Aetna coal powder A..... | Aetna Powder Co., Chicago, Ill. |
| Aetna coal powder AA..... | Do. |
| *Aetna coal powder B..... | Do. |
| Aetna coal powder C..... | Do. |
| Bituminite No. 1..... | Jefferson Powder Co., Birmingham, Ala. |
| Black Diamond No. 3..... | Illinois Powder Mfg. Co., St. Louis, Mo. |
| Black Diamond No. 4..... | Do. |
| *Carbonite No. 1..... | E. I. Du Pont de Nemours Powder Co., Wilmington, Del. |
| *Carbonite No. 2..... | Do. |
| *Carbonite No. 3..... | Do. |
| *Carbonite No. 1-L F..... | Do. |
| *Carbonite No. 2-L F..... | Do. |
| *Coalite No. 1..... | Potts Powder Co., New York. |
| *Coalite No. 2-D..... | Do. |
| *Coal special No. 1..... | Keystone Powder Co., Emporium, Pa. |
| *Coal special No. 2..... | Do. |
| *Collier dynamite No. 2..... | Sinnamahoning Powder Mfg. Co., Emporium, Pa. |
| *Collier dynamite No. 4..... | Do. |
| *Collier dynamite No. 5..... | Do. |
| Giant A low-flame dynamite | Giant Powder Co. (Con.) Giant, Cal. |
| Giant B low-flame dynamite | Do. |
| Giant C low-flame dynamite | Do. |
| *Masurite M. L. F..... | Masurite Explosives Co., Sharon, Pa. |
| *Meteor dynamite | E. I. Du Pont de Nemours Powder Co., Wilmington, Del. |
| Mine-lite A..... | Burton Powder Co., Pittsburg, Pa. |
| Mine-lite B..... | Do. |
| *Monobel | E. I. Du Pont de Nemours Powder Co., Wilmington, Del. |
| Tunnelite No. 5..... | G. R. McAbee Powder & Oil Co., Pittsburg, Pa. |
| Tunnelite No. 6..... | Do. |
| Tunnelite No. 7..... | Do. |
| Tunnelite No. 8..... | Do. |

*Reported in Explosives Circular No. 1.

Provided: (1) That the explosive is in all respects similar to sample submitted by the manufacturer for test. (2) That No. 6 detonators, preferably No. 6 electric detonators (double strength), are used of not less strength than 1 gm. charge, consisting by weight of 90 parts of mercury fulminate and 10 parts of potassium chlorate (or its equivalent), except for the explosive 'Masurite M. L. F.', for which the detonator shall be of not less strength than 1½ gm. charge. (3) That the explosive, if frozen, shall be thoroughly thawed in a safe and suitable manner before use. (4) That the amount used in practice does not exceed 1½ lb. (680 gm.), properly tamped.

The above incomplete list includes all the permissible explosives that have passed these tests prior to October 1, 1909. The announcement of the passing of like tests by other explosives will be made public immediately after the completion of the tests.

With a view to the wise use of these explosives it may be well in this connection to point out again certain differences between the permissible explosives as a class and the black powders now so generally used in coal mining, as follows: (a) With equal quantities of each, the flame of the black powder is more than three times as long and has a duration three thousand to more than four thousand times that of one of the permissible explosives; the rate of explosion also is slower. (b) The permissible explosives are

one and one-fourth to one and three-fourths times as strong and are said, if properly used, to do twice the work of black powder in bringing down coal; hence only half the quantity need be used. (c) With 1 lb. of a permissible explosive or 2 lb. of black powder, the quantity of noxious gases given off from a shot averages approximately the same, the quantity from the black powder being less than from some of the permissible explosives and slightly greater than from others. The time elapsing after firing before the miner returns to the working face or fires another shot should not be less for permissible explosives than for black powder.

The use of permissible explosives should be considered as supplemental to and not as a substitute for other safety precautions in mines where gas or inflammable coal dust is present under conditions indicating danger. As stated above, they should be used with strong detonators, and the charge used in practice should not exceed 1½ lb. and in many cases need not exceed 1 pound.

Boston Consolidated Mining Company.

At the recent meeting of the American Institute of Mining Engineers at Salt Lake the Boston Consolidated distributed a pamphlet giving in detail many interesting facts regarding its Bingham mines and Garfield mill. The data in condensed form are presented below.

Area mined, 378.8 acres, covering both sulphide and porphyry mines, which are separate. At the porphyry mine the development includes 101,914 ft. underground workings. The estimated tonnage is 37,439,000 tons of porphyry ore above 1.5% copper content. The present output is obtained by caving methods, but the mine is equipped for steam-shoveling. At the sulphide mine the development consists of 47,536 ft. of underground workings, and the mining method is by square-sets in stopes. The equipment at both mines includes: tramway, four-track gravity tram, Stine drums (air controlled), lowering 12 tons in car; length of tram 2000 ft., elevation overcome 737 ft., gradient 24 to 55%; 3000-ton cylindrical steel receiving bin; total capacity of tramway, 6000 tons per day; steam-shovels, four 90-ton; locomotives, 12; cars, 146; track, six miles narrow-gauge; air-compressors, three electric-driven, 70 drills capacity; rock-drills, 80; usual shops, warehouse, and boarding-houses. Number of employees: sulphide mine, 102; porphyry mine, 427; shops, 19; total, 548.

Mining costs for September: Production, sulphide mine, 7178 (dry) tons of ore, 310,000 lb. copper content; porphyry mine, 71,880 (dry) tons ore.

SULPHIDE MINE (SQUARE-SET METHOD).

| | Cents per ton. |
|-------------------------------|----------------|
| Stopping ore. | |
| Breaking ore | 29.1 |
| Mucking | 35.2 |
| Timbering | 50.1 |
| Electric haulage | 9.6 |
| General expense | 4.1 |
| Sulphide mine expense | 12.0 |
| Cost of mining | \$1.401 |
| Development in waste..... | 0.287 |
| Total cost of production..... | \$1.688 |

PORPHYRY MINE (CAVING METHOD).

| | Cents per ton. |
|---------------------------|----------------|
| Breaking ore | 18.8 |
| Mucking | 16.5 |
| Timbering | 7.7 |
| Electric haulage | 4.0 |
| Gravity tram | 2.5 |
| Mine expense | 5.0 |
| General expense | 2.2 |
| Development expense | 10.0 |
| Total cost | 66.7 |

Garfield mill: mill-site area, 910 acres. Buildings: foun-

dry, steel building 60 by 80 ft.; equipment (motor-driven), No. 3 Whiting cupola, No. 3 brass furnace, No. 4 Root blower, 12,000-lb. jib-crane. Machine shop: frame building, 44 by 178 ft.; equipment (motor-driven), one each of the following: 10-ton traveling crane, 36 by 24 triple engine lathe, 20 by 20 lathe, No. 6 Barnes vertical drill, 24-in. shaper, No. 55 bolt and pipe cutter, power pipe cutter, No. 21 plate shear, 8-ft. Poole boring mill, 18-in. key seater, 5-ft. Niles radial drill, 1100-lb. Bement steam-hammer. Transformer building: concrete and brick, 60 by 72 ft.; equipment, four 1000-kw. 80,000-460 volts Westinghouse transformers, three 250-kw. 460-2300 volts Westinghouse transformers, three 75-kw. 460-115 volts Westinghouse transformers for lighting; one set 80,000-volt choke coils, one set 80,000-volt arresters, one 9-panel distributing switch-board. Power transmission at 40,000 volts. Distance, 144 miles from Telluride Power Co.'s Grace, Idaho, station. Crude-ore bin: steel building, 300 by 36 ft., capacity 12,000 tons. Crusher house: steel building, 66 by 78 ft.; equipment (motor-driven), two No. 6 Gates gyratory crushers, two No. 5 Gates gyratory short-head crushers, screens, and conveyors. Mill: steel building, 326 by 590 ft.; equipment (motor-driven); crushed-ore bin, 21 by 570 ft.; 312 1500-lb. Nissen stamps (duty 114 drops per minute, 6½-in. drop, capacity 8.73 tons per stamp-day), 299 Wilfley tables, 221 Johnston vanners, 312 Callow tanks, classifiers, launders, etc. Flow from stamps by gravity throughout. Tailing and concentrate flow from mill through one central tunnel, having 13 branches beneath mill. Heating plant: frame and iron building; equipment, three 80-hp. boilers. Main pumping plant: brick building, 30 by 50 ft.; equipment (motor-driven), one 3-stage Byron Jackson centrifugal pump, capacity 3000 gal. per minute; two 4-stage wood centrifugal pumps, capacity 1500 gal. per minute. All against static head 380 ft.; 4316 ft. 20-in. wood-pipe line. Concentrate bins (concrete): nine bins, capacity 200 tons each; concentrate loaded by Browning crane into railway cars. Assay office: brick. Store-room: frame, covered with iron.

Men employed: foundry, 15; shops, 21; electrical department, 6; total, 42. Mill: unloading ore, 10; crusher house, 18; mill, 114; loading concentrate, 3; total, 145; clerical force, 5; assay office, 2; other outside labor, 34; total, 41; grand total, 228.

Results for September: received 77,003 tons; milled 72,000 tons (dry); produced 3550 tons (dry) concentrate containing 1,569,000 lb. copper; recovered 21.8 lb. copper per ton crude ore; average head 1.58%; power required, pumping 469,280 kw. hr.; milling 989,265 kw. hr.; possible stamp-hours, 224,630; actual stamp-hours, 214,145; percentage run, 95.3.

MILLING COSTS.

| | Cents per ton. |
|---------------------------|-------------------|
| Crude-ore bin | 1.09 |
| Crushers | 4.49 |
| Stamps | 21.97 |
| Wilfley tables | 2.45 |
| Vanners | 3.35 |
| Launders | 0.51 |
| Callow tanks | 1.01 |
| Loading concentrate | 0.44 |
| Tailing dump | 0.74 |
| Water supply | 7.50 |
| Heating plant | 0.04 |
| Mill expense | 3.41 |
| General expense | 3.11 |
| | 50.11 |

Spring Stamps.

The use of spring stamp-mills in South Africa and India antedated their introduction into the United States by many years. The gravity stamp is so generally used that mill-men have failed to even investigate the claims to consideration of the rapid-drop hammer-stamp. A mill of this type, which the makers claim develops large capacity with small power-consumption, has recently been put in the mar-

ket by the Oakland Stamp Mill Co., Oakland, Cal. It consists of an all-iron and steel frame resting upon a concrete foundation, comprising two independent mills, the stamps being actuated by an eccentric cam-shaft. The face of the blow is increased by properly arranged springs. The stamps weigh 300 lb., and strike 200 blows per minute. The force of the blow is computed to equal that of an 1800-lb. gravity stamp. The first mill built crushed 15 tons of Rawhide, Nevada, ore, containing large quantities of talc and clay, through a 40-mesh screen in 24 hours. The makers have issued an attractive catalogue (No. 1) describing this mill. It also contains other interesting and useful information for mill-men.

Commercial Paragraphs.

W. C. STEWART has purchased and taken charge of an assay office in Portland, Oregon.

GUY H. GIBBS, who has been with the Westinghouse Electric & Manufacturing Co. for the past eight years, four of which have been with that company's Cincinnati office, is now with the Western Electric Co. at Cincinnati.

The SHEFFIELD GAS POWER Co., Kansas City, announces that it has purchased, at bankruptcy sale the entire assets, factory, and good-will of the Weber Gas Engine Co., and that it is now prepared to furnish the Weber gas engines and gas producers.

The ALLIS-CHALMERS Co.'s eighth annual report just issued shows net earnings for the year of \$135,431, after deducting cost of manufacturing and selling, taxes, insurance, other general expenses, dividends on preferred stock of the Bullock Electric Mfg. Co., and provision for doubtful accounts, amounting to \$1,809,009.

At the second annual meeting of the ECONOMIC MACHINERY Co., held last week in its Denver offices, it was decided to enlarge its present plant and erect additional buildings for the manufacture of mining machinery. C. C. Wilson, who is president of this company, after a brief trip to the West, declares in favor of Denver as a manufacturing point for mining equipment. Salt Lake City and a prominent Pacific Coast point will also figure largely in the immediate extension of this company.

BURE & FERGUSON, engineers with offices at the Loo Bdg., Vancouver, British Columbia, are constructing a 20-mile ditch system for the Quesnelle Hydraulic Gold Mining Co., in the Cariboo mining district and are now in the market for supplies needed in the construction of dams, tunnels, ditches, flumes, steel and wooden pipe-lines, mine equipment. They desire that catalogues or literature on such supplies be sent to the above company at Quesnelle Forks, by way of Ashcroft, British Columbia, and a duplicate set to their office at Vancouver.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

MINE AND QUARRY. September 1909. Contains an interesting account of the Gunnison tunnel project.

GEOLOGY OF THE MIKONUI SUBDIVISION, NORTH WESTLAND. By Percy Gates Morgan. New Zealand Geol. Surv. Bull. 6, N. S. Pp. 175. Ill., maps. Wellington, 1908.

A monographic account of an area containing important auriferous veins and alluvial deposits.

PRODUCTION OF IRON ORES, PIG-IRON, AND STEEL IN 1908. By E. C. Harder. Advance chapter, Mineral Resources of the United States. U. S. Geol. Surv. Pp. 78. Washington, 1909.

With the statistical report are included two folded maps, showing in colors the distribution of the iron ores and of blast-furnaces in the United States.

GEOLOGY OF THE QUEENSTOWN SUBDIVISION, WESTERN OTAGO. By James Park. New Zealand Geol. Surv., Bull. 7, N. S. Pp. 112, ill., maps. Wellington, 1909.

A welcome discussion of the general and economic geology of an important gold-scheelite deposit.

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TABLE OF CONTENTS.

| | |
|---|-------|
| EDITORIAL: | Page. |
| Notes | 643 |
| Alaska and the Geological Survey..... | 644 |
| The State Mineralogist Again..... | 644 |
| A Waterways Fund..... | 645 |
| ARTICLES: | |
| The Miami-Inspiration Ore-Zone..C. F. Tolman, Jr. | 646 |
| Continuous Collection of Sand for Cyaniding..... | |
|W. A. Caldecott | 659 |
| Art of Placer Piping.....Dennis H. Stovall | 661 |
| Malm Process in Colorado.....Forbes Rickard | 662 |
| Quicksilver in Nevada.....William C. Davis | 663 |
| Calculation of Blast-Furnace Charges..... | |
|Percy E. Barbour | 664 |
| The Kapsan Mines, Korea..... | 666 |
| Kinetic Theory of Solids..... | 667 |
| DISCUSSION: | |
| English in Our Technical Journals..W. W. Strange | 668 |
| Metal Losses in Copper Slags...J. Parke Channing | 668 |
| Designing Mine Equipment.....Byron E. Jones | 669 |
| CONCENTRATES | 670 |
| SPECIAL CORRESPONDENCE | 671 |
| GENERAL MINING NEWS..... | 668 |
| THE PROSPECTOR | 663 |
| DECISIONS RELATING TO MINING..... | 674 |
| DEPARTMENTS: | |
| Personal | 672 |
| Obituary | 672 |
| Dividends | 672 |
| Market Reports | 672 |
| Company Reports | 673 |
| Publications Received | 674 |

EDITORIAL.

NOME produced \$3,975,196 this season, approximately a million less than last year. Shortage of water was the principal reason for the decline.

THE COLORADO School of Mines is distributing a convenient little circular on how to recognize pitch-blende. The demand for this mineral is so new that prospectors and others need much education. Fortunately, through the Vinson Walsh Research Department of the Colorado school, the means are at hand for giving the information necessary to a systematic search for this carrier of radium.

INFORMATION from New York affirms the consolidation of the chief copper producers by agreement reached on Thursday. The rumor seems well authenticated, but confirmation is needed concerning the parties to the combination. Those mentioned are the Amalgamated, the various Cole-Ryan concerns, Phelps, Dodge & Company, and probably the Guggenheims. The new combine is said to be closely allied with the United States Steel Corporation, Mr. William E. Corey and Mr. J. Pierpont Morgan being the negotiators. Copper stocks have advanced sharply on account of the rumors, and an excited market will inevitably follow until the facts are officially announced. The details will afford an interesting study in financial equalization of the respective advantages and disadvantages in cost of production of the interests involved. Trading of benefits must be made to effect compromises where producers of low-priced copper consent to furnish a large quota of the metal while producers of expensive copper conserve their ore supplies. Delicate problems are to be solved. The fact of such a combination having been effected seems assured. Its significance to the public is that higher prices will prevail, quotations will be made far enough ahead to insure against an erratic market, and the improvement in price and in the tone of the market will work to the advantage of the smaller independent miners and smelters.

CHESTERTON said that nobody could tell what Mr. Asquith might do next; that like as not Mr. Asquith would presently be seen standing on his head. But the British Premier landed squarely on his feet Thursday week, with a government majority of such strength supporting the budget that only some exceedingly ridiculous experiments as a political cephalopod can now weaken his leadership. The vote of 379 to 149 has so impressed the Lords that a faint gurgle has been heard from the Unionist press indicating submission. The new taxes will go hard with the peers in some respects; they will fall

heavily upon the country as a whole; and the protests against some of the socialistic measures which are absorbing immense sums are not unwarranted. With these questions of internal British politics we have nothing to do, but it is of interest to note that the determination to sustain the Government's plans involves a magnificent campaign of ship-building—if not two for every German battleship, at any rate a naval program so vast that it insures a demand for steel and copper that will be an important factor in trade revival.

WE NOTE with pleasure that the Institution of Mining and Metallurgy, London, has awarded its gold medal to Mr. William Gowland, who has just vacated the chair of metallurgy in the Royal School of Mines. The award is made "in recognition of his services in the advancement of metallurgical science during a long and distinguished career." We hope that career may be further lengthened to good purpose, for, while the Government places an arbitrary limit of age upon the retention of the appointment as professor, it is apparent that nature is more generous to this distinguished exponent of metallurgy.

Alaska and the Geological Survey.

The Director of the Geological Survey has estimated that for the year 1910, an additional appropriation of \$10,000, making a total of \$100,000 for the year, will be needed for the surveys in Alaska. Since the beginning of geological survey work in this territory in 1898, \$721,189 has heretofore been appropriated. With this money something over 17 per cent of the area has been covered by geologic, and approximately 21 per cent by topographic, reconnaissance surveys. In addition, up to the close of last year, 2304 square miles had been geologically surveyed in detail, and 2732 were covered by detailed topographic maps. During the present season 14 parties were in the field.

In addition to the areal surveys noted, a large amount of time and attention has been devoted to collection of mineral statistics, study of water resources, and, particularly, to special investigations of mineral deposits. Of the value of this work no argument is needed. It is interesting none the less to recall that in contrast with the three-quarters of a million dollars devoted by the Government to the study of the mineral resources of Alaska, a total of nearly \$150,000,000 mineral output has been realized. The gold output alone has increased in round numbers one hundred fold from 1880 to 1908, or from \$20,000 to \$20,000,000. That a part, at least, of this great increase is to be credited to the activities of the Survey is beyond question, and it is not to be doubted that the more rapidly and completely the territory is surveyed and studied the more promptly and economically will its great resources become available. At the present rate of progress it would be fifty years before the whole area could be covered by even preliminary maps, and, neglecting areas of little importance, there are at least 200,000 square miles which should be promptly investigated. Laws are now being enacted, railways built, and conditions established, which must control the industrial

development of the country for many years, if not for all time. Sound business sense dictates that the fullest information be made available as promptly as possible, if mistakes are to be avoided.

The high character of the work of the Geological Survey in Alaska is well known. We have taken frequent pleasure in commending it as an excellent example of wise administration, of nice adaptation of means to end. Taking into account funds available, the surveys have been detailed where most needed, and not too expensive where less detail was warranted. The high character of the men employed and their devotion to the work warrants the belief that the larger appropriation which conditions demand will be wisely spent, and Congress should not hesitate to authorize the larger expenditure.

The State Mineralogist Again.

A short time ago we received from the California State Mining Bureau figures of the mineral production of California for 1908 other than gold and silver. We did not publish them, as they were evidently inaccurate, and for most of the minerals better figures were already available in the advance chapters of the Mineral Resources for 1908, published by the United States Geological Survey. For example, the total value of the brick output as determined by the State Bureau was \$2,506,495; the figures given by the United States Survey are \$4,436,619. The corresponding totals for a few other items as determined by the two organizations (the State figures in each case being given first) are: pottery clay, \$325,147, \$87,126; mineral water, \$560,507, \$499,872; petroleum, \$26,566,181, \$23,433,502; pyrite, \$610,335, \$131,744; salt, \$281,469, \$374,828; glass sand, \$22,045, \$5121. After making all proper allowance for differences in classification, it is clear that one set of figures must be radically wrong. Anyone familiar with the men and methods employed by the two bureaus will not hesitate to pin his faith to the Government figures. Any hesitation to do so would be dispelled by a closer study of the local statistics. The State Bureau gives the borax production at 22,200 tons valued at \$117,000. As a matter of fact, the California production in 1908 was worth over \$900,000. Apparently the State Mineralogist is still estimating the product as though it came from the marshes. Instead it comes from mines in Inyo and Los Angeles counties, which yield colemanite containing 35 to 40 per cent of anhydrous boric acid. Valuing the natural gas at 56 cents per cubic foot is evidently a typographical error, but the value assigned to the magnesite (\$7.63) may be seriously criticised. The price is too high for crude and too low for calcined. Our main interest, however, centered in a pathetic little note to the effect that "the statistical returns relating to the precious metals, which are collected by the United States Geological Survey, were not ready for print at the date of the preliminary announcement." This interest has been revived by a second circular just received, in which the United States Geological Survey is taken to task for its failure to provide figures for the local Bureau to

publish. "Incompetency or carelessness" are hinted. If indeed there be incompetency, and as to that we are prepared cordially to agree with the State Mineralogist, all familiar with the local situation will know that the charge should be placed against the State Mineralogist rather than the Government officials. As a matter of fact, however, why should Mr. Lindgren, Mr. Parker, and the other Survey officials furnish statistics for the State Bureau to publish? If it is the function of the latter to publish the figures, it is equally its duty to collect them. All that is necessary is to get men competent to the task; men who have the confidence of the producers.

A Waterways Fund.

For several years increasing interest has been manifested regarding inland waterways; an interest which Mr. Roosevelt's theatrical trip down the Mississippi river did much to awaken, and which Mr. Taft's even more elaborate 'junket' has strengthened. There is, and has been, much unthinking enthusiasm and glib talk without limit. Only a superficial observer, however, dismisses the matter with this. Beyond question there is a deep and well founded conviction among the people that, cost what it may, the waterways must be improved and rendered available for real navigation; that it is worth the price. A scarcely less firm purpose that the work shall be done honestly and with as little as may be of waste, is also evident. The failure of past efforts to control the rivers can be properly ascribed only in part to lack of experience and knowledge on the part of the engineers in charge, a lack which is no discredit, since the problem in its size and variety is new. Mainly the failure is due to the unsystematic manner in which funds have been made available, to the higher costs of Government work, and to the contract system with its trail of political favorites. If the time is ripe to do away with these things, the time is also ripe for improving the rivers. If not, they had better wait. At least that is, as we interpret it, the attitude of the people.

Mr. Francis G. Newlands, the remarkably useful Senator who represents the whole West, though elected from Nevada, recently has come forward with a proposition for the creation of a general Waterways Fund to be devoted to this work much as the Reclamation Fund is used in irrigating arid land. Mr. Newlands emphasizes the point that the Western Senators and Members of Congress hold the balance of power, that they have superior knowledge of certain of the related problems, that the problem of the waterways if solved correctly involves the solution of the most vexatious of the secondary problems of water-storage and water-power, and, finally, that it was Western men who shaped the legislation which gave us the Reclamation Service, "the first piece of constructive legislation in the history of the country that was free from the evils of the spoils system." He does not suggest the source from which the required fifty million dollars a year is to come, but in the light of general discussion of the subject it is evident that bonds must be issued and that rentals of water-power sites are relied upon for at least a large part of the interest and contribution

to sinking fund. American States and smaller units of government have suffered frequently and severely through the issue of bonds for public improvements, and there is a general distrust of the wisdom of a large bond issue for river improvement in particular. Less objection lies against a bond issue to supplement the Reclamation Fund, or a bond issue secured by the water-power sites. In the latter case bonds are inevitable in any event. It is merely a question whether they shall be bonds of private companies with watered stock for a premium, or Government bonds, with, at worst, higher cost for installation and operation.

At Chicago in 1908 Mr. Taft pointed out that there is no objection to bonds in themselves, if the work paid for by issuing them is necessary and is well done. On the other hand, Mr. Cannon has consistently opposed bond issues; the characteristic attitude of the hard-headed country financier. No doubt 'Uncle Joe' by his opposition has, from time to time, prevented much useless as well as useful expenditure, but when, as in his recent Cairo speech, he lauds the present 'contract system' which is synonymous with the 'pork barrel' method, and hints that present revenues will "pay for the plant," we are reminded of the strings of Government dredges and boats rotting at the wharf opposite Chester, Illinois, and other points—plant paid for, manufacturers' profit realized, some single contract perhaps completed, and then the funds cut off. It is just this uncertainty as to the continuous and economical utilization of the plant, that the people wish to avoid. There are times when the public needs deliverance from its friends, and much interest, incidentally, attaches to the story that 'Uncle Joe' has been told that he can not again be elected Speaker of the House unless Mr. Taft can be persuaded to give him a friendly boost, as he did Mr. Tawney and Mr. Aldrich. No more pork barrel legislation is wanted—it were better that the rivers continue to expend their energy in carrying soil rather than commerce to the sea.

The very confusion surrounding the subject of where to begin indicates that no adequate general plan has yet been formulated. At best specifications are only available for individual parts of the work, and the relative importance of these is undetermined. What is now needed is an adequate study by a competent commission, neither a Congressional Committee nor a board of Army Engineers. The problem demands the services of the best men both here and abroad. They should be given time and funds to study the problem as a whole, but, as a guarantee that this is not merely to serve to postpone and defeat the work, a fund such as Mr. Newlands suggests, should be built up and made available for immediate construction whenever the Commission finds any part of the work which it can recommend. If, for example, the present plans for improvement of the Ohio be approved, let work be pushed as rapidly as is consistent with good results. To order that particular work without further consideration seems inadvisable in view of the fact that no provision now exists for utilization of the possible water-power. The American people have no objection to spending money, but they want to be sure of results.

THE MIAMI-INSPIRATION ORE-ZONE.

Written for the MINING AND SCIENTIFIC PRESS
By C. F. TOLMAN, JR.

The Globe region in Arizona has not been dominated by any single great company or group of companies to the extent seen in the other important camps of the Territory. Here the prospector has not been driven out, but has remained as mine-owner, and in cases he has developed his properties with success. The district presents a variety of mineral deposits unusual in Arizona. Globe was at first a silver camp with some gold production from placers, then copper deposits of ordinary type, in limestone, took precedence, to be overshadowed later by a new type of deposit (disseminations) in a formation which had been condemned by prospectors and engineers alike. These mineral discoveries have come as a series of unexpected surprises.^{*} The geological structure presents a patchwork of faulted formations that must have proved a Chinese puzzle of absorbing interest to F. L. Ransome, whose map is a triumph of geologic art. The period of the small silver 'chlorider' began with the first discoveries about 1874, and continued up to 1884. His business was to prospect and mine a part of the time, and to watch for Apaches all of the time. The years 1884 to 1898 saw the development of the Old Dominion and the rise of copper mining, which rapidly became the chief industry of the place. The year 1898 marked the advent of the railroad into Globe, and from that time until 1907, the Old Dominion was considered the big property of the district with the great future, and the Globe hills were supposed to be the premier mineral area of the region, but 1907-1909 has seen the discovery of disseminated sulphide deposits and the opening of a new productive zone, destined to take precedence over the older Globe hill area.

Geology.—According to Mr. Ransome the formations and their sequence are as follows: The Pinal schist, the oldest formation of pre-Cambrian age, containing masses of pre-Cambrian intrusive granites; the Paleozoics, represented by 1000 ft. of maximum thickness of conglomerates, quartzites, and shales of Cambrian age, overlaid by 800 ft. maximum thickness of Devonian and Carboniferous limestones; diabase intrusion, an irregular later intrusion, placed in the Mesozoic by Mr. Ransome, in the forms of dikes, sills, and lenticular masses; Tertiary and Quaternary cover, resting unconformably on all the formations enumerated above, in the form of lava-flows, terrestrial conglomerates, and others, which is but the outer edge of a more extensive series developed northwest of the area.

The absence of the post-Paleozoic granitic intrusion, which occurs in connection with the copper deposits of the other camps of Arizona will be noticed. Observation and theory alike call for an acid intrusion to furnish the copper waters. Nowhere in Arizona do basic rocks, such as olivine diabase, develop contact-zones suggesting the presence of such waters. The copper deposits of the Pacific Coast which Waldemar Lindgren thinks are related genetically to

basic greenstone flows, differ in many respects from the deposits in southeastern Arizona, and furnish no proof that basic rocks can generate a copper depositing circulation in adjacent formations. The opening of the Miami deposits brought Walter Harvey Weed into the district, and his detailed work (which I give from his oral statements), convinces him that the Schultze granite is post-Paleozoic (Tertiary?), and intrusive in the schist. This explains the Miami-Inspiration deposits as lying along the granite-schist contact, but do the orebodies of the Globe hills still remain 'a law unto themselves'?

The Globe hill quartzites, limestones, and diabase are broken into strips by major, and often ore-bearing, northeast fissures. These strips are cut into blocks by a more irregular northwest faulting. The ore deposits are either veins, along the fissures, especially in the diabase, or are spread out from the fissures as replacement-bodies in the limestone. This much is certain, the deposits are connected with fissures. Do these fissures lead into a deeper mass of diabase, or is there any evidence that the Schultze

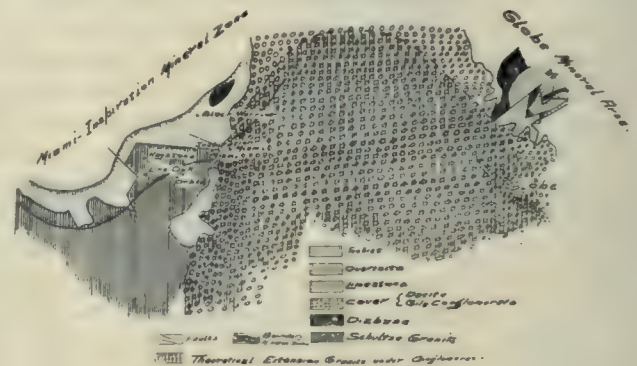


Fig. 1.
Geology of Miami-Globe Region. (After Ransome.)

granite underlies at moderate depth, and was the source of the mineralizing waters, as it undoubtedly was in the neighboring Miami-Inspiration zone. As has been shown in the descriptions of Bisbee and Morenci-Metcalf, and as suggested for the Ray region, there is reason to believe that the intrusive masses spread far out underneath the older intruded rocks, and that the ore deposits are formed at favorable places near the upper contact, where there was an escape for the copper-bearing vapors, distilled from large masses of the underlying acid-rock. A glance at Fig. 1 will show that the Schultze granite is found six miles to the west of the Globe hills bordering the Miami-Inspiration ore-zone, and disappears under a covering of Gila conglomerate, which extends up to a fault southwest of the Old Dominion shaft-house. This fault bounds the orebodies of the Old Dominion on this side. A trip across this conglomerate on foot showed that the boulders are largely of Schultze granite, and along the fault mentioned a deposit of boulders is exposed, with no assorted fine material, the boulders reaching a maximum size of 4 ft. diam., and resembling a brecciated mass of granite in place, rather than a detrital conglomerate. It is inconceivable that these masses of granite could have undergone long water-transportation, and it seems at least reasonable to suppose that they are the result of the disintegration of a nearby mass of Schultze granite, later completely covered with the

detrital conglomerate, and that the mineralization of the Old Dominion fault-zone is due to this same intrusive. This hypothetical extension of the granite is shown in Fig. 1, which otherwise is a simplified sketch from Mr. Ransome's map.

The Miami-Inspiration Ore-Zone.—This mineral zone extends along the contact of the Schultze granite with the schist from the Black Warrior on the northeast through the Miami and Inspiration properties where the schist is the ore-bearing formation, and on through the Keystone and Live Oak where the ore extends into the granite near the contact. (See Fig. 1.) In brief, the zone may be defined as an

Joe Bush shaft of the Inspiration company southeasterly through the Miami ground. The surface of this breccia and the adjacent schist is stained blue with copper silicate and some carbonate. This is the surface outcrop of the 'silicate' ore that can be followed down through the workings. (See Fig. 2.) A fault, difficult to recognize on the surface, but showing excellent slickensides, and gouge underground, separates the schist from the Gila conglomerate. Between this main Gila conglomerate fault and the orebody the schist is shattered, leached, and full of slips. The orebody as now developed lies between these two important structural features, namely, the Joe



Fig. 2.

iron-stained, more occasionally copper-stained, area of schist extending from the Black Warrior to the Needle mountains, the zone extending in places beyond the contact into the granite. For a long time this was thought to be a worthless surface-stained area, but the opening of the Bingham and the Ely deposits suggested the possibility of disseminated deposits under the leached schist near the carbonate and silicate outcrops. J. Parke Channing was favorably impressed with the district, and decided to test the Miami. Within about two years the company has driven some 30,000 ft. of workings, opening ready for stoping somewhere between 10 and 14 million tons of ore from which it is expected that there will be recovered between 500,000,000 and 600,000,000 lb. of copper.

The Miami Orebody.—A silicified fault breccia is easily identified on the surface, extending past the

Bush silicified breccia, and the fractured zone parallel to the Gila conglomerate. The dike of Schultze granite porphyry is uniformly mineralized, having the same assay value as the schist, and structurally has had no modifying effect on the chalcocitization. The plans of the main levels (Fig. 2), which are only rough, idealized, notebook sketches, show how the orebody starts from a point as an apex, about 200 ft. below the surface. The first shaft was sunk on one side of this apex, and it is reported that not striking ore at the expected depth, serious thoughts of abandoning the property were entertained. Had this been done it is probable that the copper of this great ore-zone would have been saved, perhaps, for future generations, for all the subsequent developments in this region have been done on the strength of the work of the pioneer company. The shell of silicate ore partly surrounds the chal-

cocite dissemination, carrying 2% and more of copper, and is of possible use as silicious convertor-lining, or, perhaps, as leaching ore. Leached country rock extends the rest of the way around. The silicified shell forms a rather impervious bar that resists the descending enriching solutions, and has been an important feature in guiding the development of the chalcocite deposit, while the open country along the Gila conglomerate carried down the ore in that direction to the unusual depth as shown in this mine.

On the first main level (270 ft.), one acre of ore has been developed with an average value of 3.19% copper. The next (370-ft. level), shows 11½ acres developed at present averaging 2.96% copper. On the 470-ft. level there has been developed already 16 acres, assaying 2.75% copper, and on the 570-ft. level the boundaries of the ore have not been reached,

copper-stain, and when in contact with limestone develop garnet-contact zones. When these intrusions are a normal fine-grained porphyry, as for instance the Sacramento stock of Bisbee, or when they are in contact with, or cut Paleozoic strata, there is little danger of confusing them with the old pre-Cambrian inert granite intrusions. Identification of the mineralizing intrusions is more difficult when they are granitic instead of fine-grained porphyritic. The following criteria for the separation of the two classes of intrusives are applicable only in the southeastern Arizona region, and are provisionally offered. The pre-Cambrian granites are even grained. They do not develop extensive porphyritic facies near contacts and in peripheral dikes. The occasional development of the gneissoid and schistose structure is peculiar to the older granites. Stratification of the granite with schists and gneisses indicates pre-Cam-

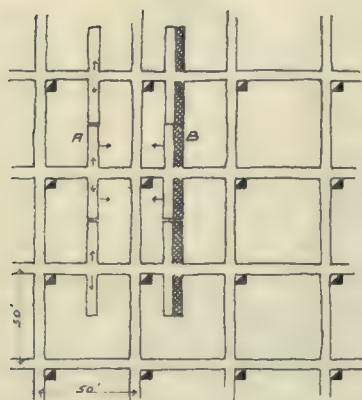


Fig. 3. Plan.

All levels and sub-levels (25 feet apart) are laid out according to this plan. At A and B the top slicing is started, the arrows showing the direction of retreat.

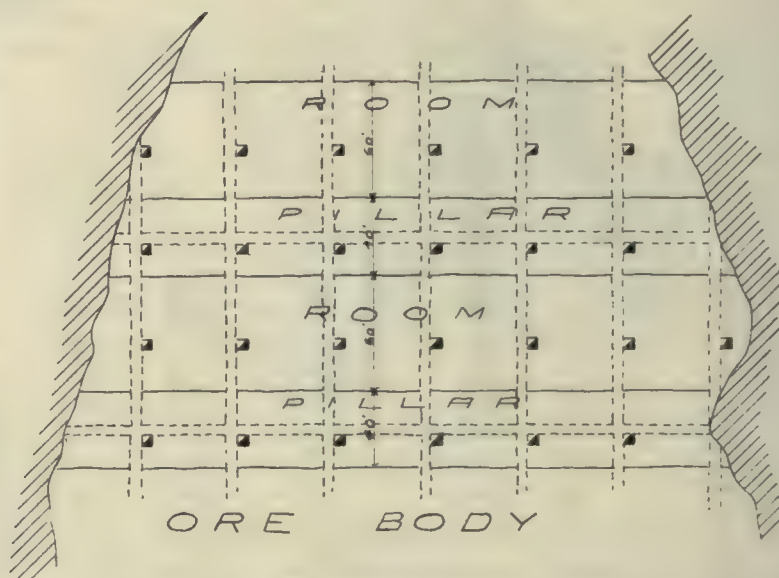


Fig. 4.

Plan showing system of extraction drifts in each level and sub-level, with alternate pillar and room, and raises.

the average value of the material driven through being 2.65% copper. The top shell of the chalcocite orebody carries the highest metallic content, in places reaching 5%, but soon dropping to the average below.

Genesis of the Ore.—As far as I am aware the original unenriched ore has not been found in the Miami, as yet. The schist area to the southwest, however, contains disseminated chalcopyrite, probably primary ore, and the Gibson deposits are high-grade narrow chalcopyrite veins. This suggests the probability of chalcopyrite and copper-bearing pyrite as the original ore developed by the intrusion of the Schultze granite, the faulting starting soon after the intrusion, and continuing up to recent times, silicification starting in the fault breccias, and spreading into the schist. The commercial ore is, of course, a secondard sulphide deposit, a concentration by descending waters of metal leached from above.

Summary of Geology.—In southeastern Arizona the copper orebodies are found in the vicinity of copper-bearing post-Carboniferous granitic porphyry intrusions. Such intrusions often contain considerable

brian age. The muscovite granites, as far as I have observed them, are all pre-Cambrian.

The post-Carboniferous granites are always porphyritic. Even where holocrystalline, large feldspars occur the Schultze granite and the Ray granite contains feldspar crystals up to even four and five inches in length. The Helvetia granite shows crystals nearly as long. Along dikes and contacts fine-grained porphyry facies occur, often very silicious. The outcropping schist above the copper disseminations shows areas that have suffered considerable silicification. This is more noticeable at Ray than at Miami. Studies are now being carried on to determine what portion of the silicification accompanied the primary mineralization, and what, if any, is caused by descending alkaline waters, with the copper in solution as bicarbonate and silicate, as has been suggested in a previous paper. On the Miami ground fine specks of iron in the schist lie over the ore, and are the residuum left by the oxidation of the disseminated pyrite and chalcocite. This is the most important criterion indicating the deposits below. At the Ray the leaching has gone further, but even there residual

iron specks can be detected in the bleached white schist. Copper salts (carbonate and silicate) are invariably alongside or over a portion of the orebody. They represent the indurated portion of the cap that has resisted leaching, and the best bodies can be expected under the softer, more leached rock, adjacent to the stained area. Finally the structural features govern the descending copper-bearing waters, and, therefore, determine the position of the orebody. At the Miami, the orebody opened to date has been found to lie between two fault-zones. At the Cactus properties, it has been reported that the upper surface of the diabase intrusion has been the guiding

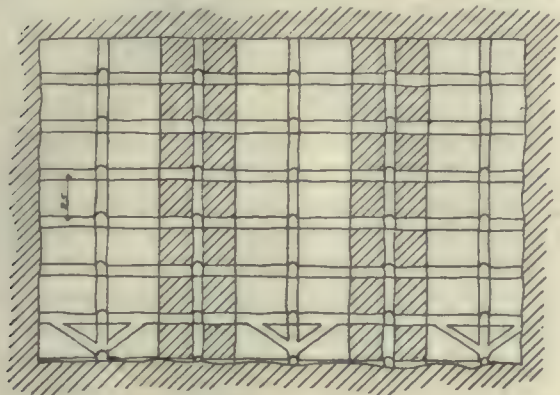


Fig. 5.

Cross-section through series of pillars and rooms.

feature, the latter in this case being impervious to the descending waters, turning them back into the schist, and the highest metallic content is found along this contact. At Ray the main structural feature is the Pinal creek fault, the ore-mantle dipping and extending to this fault, and as should be expected from

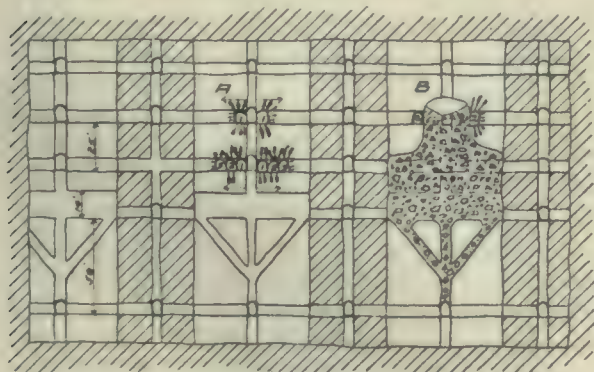


Fig. 6.

Cross-section through pillars and rooms. A. cross-drifts being driven toward pillars. B. broken ore.

this structure, recent developments are showing that the ore-stratum has excellent metallic content under Pinal creek up to the fault. The wide red iron-stained belt along the contact of the granite with the schist marks the general extent of the Miami-Inspiration mineral zone, and the portion of this extensive area that is underlain by economic deposits is now being determined by active development along the belt.

Mining Methods.—The system of blocking out this great orebody, and the plans for mining it, developed by N. O. Lawton, the superintendent of the Miami Copper Co., show a number of novel features, and although the stoping operations have not yet

been started, it will be of great interest to know, later on, how far, if at all, these ingenious plans will have to be modified as mining operations proceed. As the short time at my disposal during my visit at the mine, precluded close study of the operations, I submitted my sketch of the methods to Mr. Lawton, who has kindly reviewed them, making a number of corrections that have added to the accuracy and clearness of the descriptions. Two methods are planned, the ordinary Lake Superior top-slicing method, and a room and pillar method, with attack of the rooms by sub-levels from the pillars, named by Mr. Lawton "the auxiliary raise and sub-level stoping method."

The mine is laid out in multiples of 50 ft., and all the workings are numbered by a co-ordinate system, the north and south drifts being 50 ft. apart, and the east and west drifts 50 and 100 ft. apart. All levels and sub-levels are directly above one another and are practically duplicates in so far as the size of the orebody on the different levels permits. Raises are put

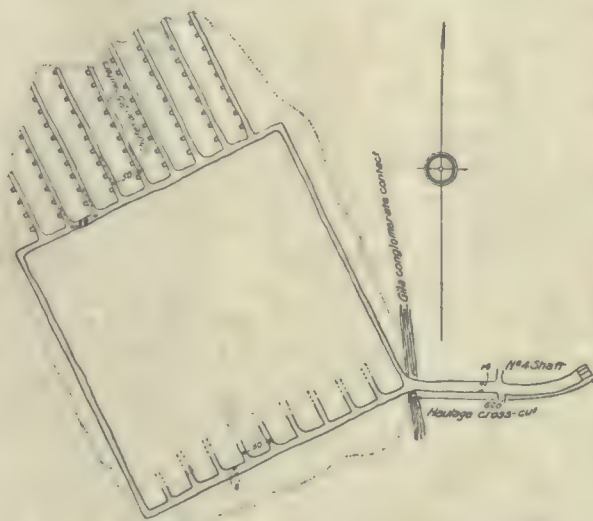


Fig. 7.

Plan of haulage roads. (After Herrlek, *Mines and Minerals*.)

up to the capping every 50 ft. along both the north-south and the east-west drifts. They are placed in the corner of the blocks, at one side of the drifts, giving clear passage-room on all the sub-levels, and preventing as much as possible certain 'unlucky' miners from exercising their penchant for stepping down chutes. Sub-levels are opened from the raises every 25 ft. in height, and drifts are run connecting the raises as noted above. With the mine blocked out in this way, any system of sub-level mining can be used, and may be changed from one to another as necessity may arise during operations.

In the top-slicing system attack is started by driving cross-cuts into the centre of each block, on either side of a raise, these cross-cuts meeting similar workings from the drifts as shown in Fig. 3. The driving of this cross-cut takes a slice about 6 ft. high, and retreating along the same drift, the overhanging ore is taken down by upper shots as well as an extra slice along the side of about 4 ft. by side-shots. The distance between slices is $12\frac{1}{2}$ ft., so that less than half is taken out on the advance, and the rest on the retreat. After the ore has been removed the

overburden is made to cave in small sections by pulling the timbers. This driving and retreating is repeated, working back toward the raise. In the combined methods, a room and pillar together will have a width of 100 ft., and run across the orebody, Fig. 4. The extraction drifts and raises having been driven as described above, the only modification is that in the block that is to be mined as a room, the raises will be branched between the first sub-level and the extraction level, as shown in Fig. 5, while in the pillars they will be vertical as elsewhere in the mine, and be used as manways. Mining will begin 50 ft. above the first extraction or tramming level, where the room is cut out the full size of the pillar, 8 ft. high, and then a cut is blasted off the roof, making the height of the room about 14 ft. Operations are transferred to the next sub-level above. Cross-drifts are run from the main drifts beginning in the centre of the room, each cross-drift meeting a similar working from the next main drift, just as was done in the top-slicing method. (See Fig. 5 and 6.) The order of this cross-cutting, or side-stoping, is 1, 2, 3, as shown in Fig. 5, the retreat, of course, being toward the pillar. When driving each cross-drift, not much over 6 ft. of ore is broken, but on the retreat long holes are driven in the roof and in the floor and on the side toward the pillar, the ore being broken through to the room below, half way up to the sub-level above, and an extra slice is taken off of the side. Operations are then transferred to the next sub-level above, and before blasting each slice, sufficient broken ore below is drawn off to make room for the addition. The novel feature is that this method permits of the men always working in solid ore on all the sub-levels, and allows large cuts or ore burdens on the long machine holes, with resultant economy. On reaching the top, the mat is laid, and if the pillars and roof do not stand well enough to permit drawing the ore during the operations, the roof is caved and the fill is drawn off. The plan is then to remove these pillars by top-slicing, but any other of the many possible ways to attack them can be adopted. It appears to me, that theoretically the best method would be to weaken the pillars sufficiently by stoping so that the drawing of the rooms would take down the entire orebody, pillars and all, or a large section of it. Probably enough consideration has not been given, in the development of caving methods, to the advantages of drawing down evenly large areas of ore, thereby obtaining the minimum mixing of ore and cap, and the maximum self-grinding action during the drawing. Mr. Lawton comments as follows on this new 'auxiliary raise and sub-level stoping method' described above. "I estimate that over 50% of the ore can be removed from rooms very cheaply by this method, recovering a high percentage of the ore, and keeping the same clear from mixtures of rock. After the rooms have been mined by this method, the pillars will be taken by the 'top-slicing method', or 'sub-level caving method' (the word 'caving' as here used applies to the cap-rock, or over-burden, allowing the same to cave as the ore is removed, and does not apply to the ore, as none is to be mined by caving it). In a general way, the 'auxiliary raise and sub-level

stopping method' is similar to the 'back-stopping method', but instead of the men working in the open room, and standing on the broken ore while stoping, as necessary in the 'back-stopping method', they work from the pillar or solid ground; in other words it consists in stoping and mining the ore by means of auxiliary raises and sub-levels, namely, after cutting out the room the proper width and length at the level where mining is to begin, a cut is then blasted from the back, which will make the room about 14 ft. high. Thereafter the drilling and blasting is done from the sub-levels. Side holes, uppers, and down holes are drilled from the sub-levels, working from the centre of the room back toward the pillar. The men are thus always working in the solid ground, and use the raises in the pillars for going to and from their place of work. In some cases the ore can be drawn from the rooms as fast as broken until the capping is reached; in other cases it will be necessary to leave the room full to keep the pillars intact or from sloughing. After the room has been mined, and the ore drawn off, it will be allowed or made to fill with cap-rock, and the pillars are then removed by slicing from the top. These slices at the Miami will be 12½ feet. The tramming system is also peculiar to the Miami. It is a rectangular system, with a rectangle in the centre and lateral drifts running out from three sides to the extremities of the orebody. The system allows the drifts to be laid out directly under the levels above, with only 'one way turn-off' at any point, and all the switch-points running with the loads toward the shaft. (Fig. 7.) Tramming levels are placed 50 ft. below the levels on which the mining is to begin, and a series of raises with inclined branches are run up to the bottom of the rooms by which the ore will be drawn into the cars and thence trammed to the shaft. The important points claimed for the 'auxiliary raise and sub-level open-stope method' in connection with the 'sub-level caving method', are: a large percentage of recovery, a clean product, cheap mining, safety for the men, and exceptional facilities for watching the operation of the stopes; also the elasticity of all development work for this method, it being such that we can grade from the 'auxiliary raise and open-stope method' to the 'top-slicing method' or the 'top-slicing caving method' as desired, or as may become necessary in the process of mining." Mr. Lawton states that the blocking of the ore ready for mining, has cost from 12 to 14c. per ton, and the total mining cost is conservatively estimated about \$1.25 per ton, although it is confidently expected to produce it for less than \$1 per ton.

Tin ore is not usually accompanied by manganiferous minerals. The characteristic associates of cassiterite are fluorite, topaz, tourmaline, and spodumene; that is, minerals containing fluorine, boron, and lithium. But tin oxide is undoubtedly dissolved by alkaline waters, and re-arrangement of the tin-content in the original lodes is often produced as a result of the alkaline waters formed in the decomposition of the feldspars; so that it is quite conceivable that cases should arise where subsequent vein-filling had resulted in bringing manganese in considerable quantity into association with tin.

CONTINUOUS COLLECTION OF SAND FOR CYANIDING.

By W. A. CALDECOTT.

*Given adequate plant, a total residue of only one-third of a pennyweight of fine gold per ton of ore, equivalent to 93% extraction on 4.8 dwt. ore or 96% or 8.3 dwt. ore, is usually obtainable with profit on the Rand.

The capital expenditure on plant still remains absolutely high for a huge modern plant handling several thousand tons of ore daily. As regards the secondary treatment, I was authorized in the beginning of 1907 to endeavor to effect some saving in the cost of the usual cyanide plant. It appeared that the most likely prospect of success lay in eliminating the sand-collecting vats, or rather in utilizing them for treatment purposes instead of merely as sand-storages, which take the place of the old tailing-dams. The upper vats of the superimposed type of sand plant were, on their first introduction before the war, utilized as treatment-vats as well as sand-collectors, but the results of contamination of mill-water with cyanide caused this practice to fall into disuse, and in any case a considerable time elapsed between the filling of a vat and its charge yielding gold-bearing solution to the boxes. Hence, although it reduced cost of transfer to a minimum, this type of plant fell into disuse as being expensive, and having only one-half its capacity available for extraction purposes, and was replaced with separate blocks of collectors and leachers (with belt or truck transfer) in the ratio of 1 to 2 or 2 to 5, which is now the common practice.

The use of conical classifiers appeared the most ready means of removing the great bulk of the slime and water, and in the early part of 1907 I tried at the Knights Deep-Simmer East joint plant various combinations of such classifiers with other devices for removing the surplus moisture from the thick sand-pulp underflow of the classifiers. The ordinary type of slime-filter with vertical filter-leaves was obviously inapplicable, and a continuous action was desirable, while the question of washing the sand-cake on the filter did not arise at this stage. A practicable centrifugal separator with continuous discharge was not known to exist, and finally a horizontal type of vacuum-filter appeared the most feasible device. The first filter constructed on this principle was a horizontal launder with false filter-cloth bottom, below which a vacuum was maintained. The sand-pulp was continuously fed into the filter-launder at one end and scraped slowly forward by a belt scraper-conveyor to the other. But a certain measure of success was thus attained, the continuous movement and disturbance of the layer of sand-pulp undergoing filtration prevented efficient removal of moisture, and the trial of another filter of the same type but with a worm scraper-conveyor yielded no better results. Finally there was installed a slowly rotating horizontal filter, which proved so satisfactory that little modification in its design, except increase in dimensions and varia-

tion in details of driving mechanism, has since been made. This sand-filter was 10 ft. in external diameter and consisted of an annular launder 12 in. wide containing a filter-cloth as a false-bottom. The filtering area was thus 28.3 sq. ft. The space under the filter-cloth was connected by means of radial pipes to a central hollow spindle, in which a vacuum was maintained from a receiver. To the lower portion of the receiver was connected a water-pump and to the upper a vacuum air-pump. This filter gave such promising results, by handling sand in unwashed sand-pulp at the rate of up to 200 tons per day, that another, 15 ft. in external diameter and with 18 in. filtering breadth was constructed at the Knights Deep. Among other results over 1600 tons of sand were collected by this filter and transferred by belt to the leaching vats, and when treated yielded somewhat better extraction than usual.

At the present time the underflow of the primary cones at the Simmer & Jack, being too low to gravitate upon the table, is mixed with slimy water from the tailing pulp to form a fluid pulp and pumped into a secondary cone, placed above the table and delivering upon it a thick flow of pulp containing about 30% of moisture. To ensure a thick steady underflow of pulp in large amount a disc, which I have termed a diaphragm, is placed near the bottom of the cones, which are run nearly filled with settled sand. This device has been adapted for tube-milling classification. The sand from which the surplus moisture is removed during the almost complete circuit of the filter, is continuously scraped off by a fixed incline plow some three feet behind the point of onflow. It falls into a hopper where it mixes with a stream of cyanide solution and is pumped to the distributor of the collecting and treatment vat, which the solution overflows to a solution-storage and is returned by a pump to the hopper, thus completing the circuit. In this way the transfer of the sand from the filter to the vat is effected as a pulp, and an excellent start of the dissolving operation is made by the agitation and aeration the sand undergoes in the pump, and during its travel along the delivery pipe or launder to the collecting vat. The system of solution-transfer has the advantage of great flexibility and relatively small cost of installation, while the operating cost is mainly that of power and maintenance of centrifugal pump liners and propellers. The dissolving of the gold in the sand hence begins on falling into the hopper, within half an hour after the ore is crushed, and by the time the vat is filled and drained half the gold in the sand is dissolved.

An important feature of the Simmer & Jack trials was the determination of the relative extraction yielded by completing the treatment of the sand in the vat where collected, as compared with the result of transferring the charge by truck after first treatment to another vat, but the final result was much the same; yet the transfer, and consequent aeration of the particles while moistened with cyanide solution, ensured a quicker dissolution of gold, so that while six days actual treatment sufficed with transfer, nine days was required to complete the single-vat treatment.

The 15-ft. table has been in regular use from the

*Abstract of paper read before the Chemical, Metallurgical & Mining Society of South Africa.

end of last year and has handled up to 10,000 tons of sand per month. The following comparative results are averages from January to July, inclusive of ordinary and continuously collected sand:

| | Continuous collecting. | Ordinary system. |
|---|---------------------------|---------------------|
| Tons of sand treated monthly..... | 7,937 | 37,009 |
| Grading analysis— | | |
| + 60 (0.010 in.)..... | 12.9% | 10.9% |
| — 60 + 90 | 32.7% | 24.1% |
| — 90 (0.006 in.)..... | 54.4% | 65.0% |
| Ratio of solution to sand applied as washers to charge..... | 1.54 to 1 | 2.02 to 1 |
| Number of days treatment in sec- ond vat after truck transfer..... | 4.09 | 6.50 |
| Percentage extraction | 82.878 | 81.594 |

It will be observed that owing to the more perfect elimination of slime the sand filter product is coarser and richer than the ordinary sand, and that the solution precipitated and the time of treatment in the secondary vats are much less with filter-table sand than ordinary sand.

Early in the present year two 20-ft. diam. sand-filters, each with filtering launder 30 in. wide and 137.5 sq. ft. in area, were installed at the Simmer Deep-Jupiter joint plant, and after some preliminary runs have handled all the sand produced during the last five months, up to 2600 tons of ore being milled at times per 24 working hours. The capacity per square foot of filtering area of the Simmer Deep sand-filters is about 50% greater than that of the Simmer & Jack filter, owing to the slime being so thoroughly washed out that less than 1% remains in the collected sand. As a rule the vacuum varies between 3 and 10 in., and the vacuum air-pump and tables each require about 5 hp. to run. The pump drawing water from the receiver in which the vacuum is maintained requires about 3 hp., as does also that supplying the glands of the centrifugal pump which elevates the sand-solution pulp to the collecting vats. The last pump mentioned is the main source of power consumption and requires 40 hp. The plow is merely a thin steel sheet with a renewable wearing edge, and is capable of being raised and lowered so as to periodically remove the top compacted layer of the permanent bed. The maintenance on the slow moving tables (about one revolution in three minutes), is practically nil, though the usual wear on the centrifugal pump in handling even some sand takes place.

The recent remarkable development on the Rand of centrifugal pump elevation of pulp has greatly assisted in developing the method of solution-pulp transfer, and obviously the same plan could be adopted for transferring sand from the collectors to separately placed second treatment vats, but for new plants the superimposed vat system, when only shoveling down is needed, is still simpler and cheaper. The solution required for pumping the sand as pulp is about four or five by weight to one of sand; the ratio is kept as low as is compatible with the grade of the delivery launder or pipe. While collection is still proceeding, and before the vat is filled, the leaching off of solution from the vat is begun, and after the vat is filled as much more wash-solution is applied as there is time for before transfer, with the result that half to two-thirds of the

gold content of the sand is in the zinc boxes before transfer begins, and before treatment would commence at all under ordinary practice. Before delivering the sand-solution pulp to a collector the latter has three or four feet of precipitated sand solution pumped into it, the exact amount being regulated by that which is regularly withdrawn from the solution transfer circuit in the shape of solution leached from the collectors for precipitation; in this way an equilibrium of the stock of transfer solution is maintained, and at the same time its gold value is kept low, being usually under 0.2 dwt. per ton. It is found that the best work is done and driest sand obtained with the lowest vacuum; owing to the greater volume of air being drawn through with a more porous permanent bed; when the air has thus been renewed the moisture in the sand removed is about 13%, and this percentage slowly rises to say 19.5 immediately before the next renewal.

The slime overflowing the sand collector carries with it a small amount of fine sand, as is usual with a distributor, especially when the vat is nearly filled with sand. This sand may be intercepted on its way to the solution storage by means of one or more cone-classifiers, with the underflow gravity back to the sand-solution pump. As, however, the accumulated slime in the bottom of the solution-storage is periodically pumped to the slime-plant with solution, the fine sand may be removed at this stage by cones.

One somewhat unexpected result of the cone classification in the sand-filter installation is the appreciable increase in the slime-tonnage, which may be taken at about 40% of the weight of the ore in place of say 32% otherwise to be expected. This is mainly due to the separation as slime in the conical classifiers of 200-mesh sand.

The collecting vats employed to receive the almost slime-free sand-solution pulp may be of larger dimensions than usual, as settlement of slime in layers is not to be apprehended, and fewer larger units thus employed in place of more smaller ones. For the same reason the bulk of the lime used may be crushed with the ore in the battery, thus reducing the separate grinding of lime in a ball-mill or other machine to occasional periods when unusually acid ore is being delivered to the battery. Naturally the use of sand-filters greatly increases the capacity of existing plants whether of the superimposed or other type, by converting all the collectors into treatment-vats. The advantages which sand-filters present are considerable saving in capital expenditure both for sand-vats and belt or truck installation, slightly better extraction than the ordinary system, unless prolonged treatment is given, a saving with superimposed vats of belt or truck transfer cost, and more slime to be treated as such at, say, 6d. per ton less than sand in vats of slightly increased diameter. Evidence as to reliability in practice and low cost of operation has been given, and considerable extension of continuous sand collection both for new plant and for increasing the capacity of existing plants is now being designed or is actually in process of construction, so that within a year the present fifty odd thousand tons of sand handled monthly by this method on these fields is likely to be doubled or trebled.

ART OF PLACER PIPING.

Written for the MINING AND SCIENTIFIC PRESS
By DENNIS H. STOVALL.

Some superintendents and managers say that a good piper is half a placer mine. To the initiated this statement will not seem far-fetched. Without a good piper, or at least without a piper who knows a few of the main tricks of handling a giant, an otherwise payable mine will fail. The piper is the fellow who 'gets the stuff from the dirt', and it is 'the stuff' that counts. On the Pacific Coast, where gigantic hydraulic mines are common, 'piping' is an art. 'Pipers' are 'professional men', and proud they are of their 'profession', as they have a right to be, for piping is not picked up in a day. Like prospecting, engineering, and other phases and branches of the mining business, piping is an art that requires years to give perfection, or that degree of ability that men call perfection. Pipers demand and receive excellent wages, and there are few of them but earn every dollar that their pay-check represents.

To the expert placer-piper the roaring, singing monitor, that yields to the deflector's slightest touch, is, as it were, a living, breathing thing. A hydraulic giant is to him as a tamed lion to its master—obedient and powerful. None know better than he how best to swerve the big nozzle, to drive an avalanche of boulders down the gulch ahead of the giant's stream, scattering them like a handful of bullets shot from a catapult; or to bring that long, deep growl from the monster as it gnaws at the base of the towering red clay bank, till a great slab of a thousand tons topples and falls with a mighty crash from the mountain side. Clad from hat to boots in rubber and wool, the piper is at his post every day of the mining season, no matter how swiftly the wind may blow or how icily it may bite, or whether the rains pour, or the snows pile the diggings under a mantle of white—he is always there, directing the giant's powerful stream.

Other things being equal, the piper can remove the greatest amount of dirt in those diggings supplied with ample by-water, or 'by-wash', as he calls it. Without plenty of by-water to assist in driving the torn-down gravel to the sluices, the piper is greatly handicapped, for as much or more of his time must be used in 'driving' as in 'cutting', and all the time required for the former operation robs the bank of just that much time from the attention of the giant. Rather than operate a battery of three giants, it is best to operate only two, using the third for by-water, or to increase the supply of by-water already available, unless that supply be already amply sufficient.

It is not always the biggest or most powerful giants that remove the greatest amount of gravel within a given time. Too frequently the big giants must gnaw at the base of towering banks—banks so high that it is dangerous for the piper to approach closer than 300 or 400 feet—and thus the 'cutting power' of the stream is lost before the gravel is reached. The 'cutting power' is the main thing in the work of tearing down stubborn or cemented gravel. The 'cutting distance' of a stream varies, of

course, with the size and pressure, but most pipers estimate it within the range of the 'unbroken section'. If one will observe a hydraulic stream for a moment, it will be noticed that for a certain distance it is an unbroken shaft of white, the water being held to a direct course with scarce a curvature or downward drop. To strike the stream within this limit, is almost like striking a shaft of steel; to thrust the arm into it is to have the limb torn from its socket. Beyond this limit, however, the stream is broken, and has less cutting power. The piper attempts to keep his giant close enough to the bank to be within the cutting range of the giant's stream, moving the monitor as often as necessary.

The efficiency of the grizzly elevator in removing



A Piper at Work.

boulders from diggings which have not adequate dumping facilities, depends almost entirely upon the ability and adeptness of the piper. Even where grizzlies are not employed, the diggings are kept clean by the 'driving' of the piper. It is in these mines that a good piper is an absolute necessity; for otherwise the diggings would soon become hopelessly choked with debris. Where a grizzly is employed, the lead-race brings all of the gravel, by-water, dirt, and boulders from the diggings to the base of the elevator; the operation to this point is automatic, so to speak, but it is the duty of the piper to complete the performance. He dexterously separates the boulders from the finer stuff, and 'juggles' them up the incline, driving them like sheep up an inclined corral. Rocks, stumps, roots, and logs alike, find a common dumping-ground beyond the stacker. The

grizzlies, used by pipers in removing boulders and debris from flat diggings, are made from 10 to 15 ft. wide, and from 24 to 40 in length, with the sides boarded up to a height of 8 or 10 ft., and the whole setting at an angle of about 18 degrees. This raises the upper end from 25 to 30 ft. from the level of the bedrock, and gives ample dumping-ground for the season, the elevator being moved to another part of the diggings for the succeeding season. The floor of the grizzly is arranged with parallel steel crevices, like pole-riffles, running the long way of the elevator. While the boulders and coarse rock are being shoved up and over this by the water from the giant, the black-sand and the gold drop down into the crevices and slide back to the base of the grizzly and into the sluice.

MALM PROCESS IN COLORADO.

Written for the MINING AND SCIENTIFIC PRESS
By FORBES RICKARD.

The Chamber of Commerce of Georgetown, Colorado, has donated a mill-site to the Western Metals Co. The main retaining-walls are up, and the framing is about finished, for a mill-building of 50 tons capacity to demonstrate on a commercial scale a dry-chlorination process which has been perfected by John L. Malm, electro-chemist for that company. This plant follows years of patient experiment and research in developing this process and in working out improvements in its mechanical manipulation. In the last five years this is said to represent an expenditure of nearly a quarter of a million dollars and the scrapping of \$100,000 worth of machinery and apparatus. An experimental plant was first built in Corbin, Montana, in which the details of the process were worked out on tonnage basis, and in which many of the earlier difficulties of manipulation were overcome. The selection of this part of Colorado was presumably because the process aims primarily at the utilization of low-grade zinc sulphide ores, somewhat complex, with associated gold, silver, copper, and lead, of which there is an abundant supply in the district. Local conditions in respect to the making of a merchantable product are such that the intermediate process of concentration is indispensable under adverse conditions, in point of the saving effected, while for the smelter the precious metals are insufficient, with zinc, lead, and copper so proportioned in the ore as to fall under the minimum for which the smelter pays upon the existing schedule.

This process, in introducing an economical metallurgical practice where standard processes have stopped, has its field well defined. The Western Metals Co., of Denver, has purchased numerous patents growing out of the Swinburne and Ashcroft patents of 1897, which first gave prominence to a process which consisted, (1) in the conversion of the metal or metals in simple or complex sulphide ores into chlorides by the use of chlorine gas at a temperature of about 100°C.; (2) in the recovery of the metals by the substitution of one metal for another until zinc chloride alone remains in solution; and (3) in the electrolysis of the fused zinc chloride for the production of metallic zinc and the recovery of

chlorine. The chlorine gas is obtained through the electrolysis of common salt. As indicated in the foregoing paragraph the process is regenerative in respect to the chlorine, the loss in the entire cycle approximating 5 per cent.

According to Stuart Croasdale, who is consulting engineer for the Western Metals Co., this process has been in use in Europe for some time, both as an independent operation, and as a subsidiary to the soda industry for the utilization of chlorine. Mr. Croasdale has specialized in the volatilization of metals as chlorides, in collaboration with Edwin C. Pohle. In the mill practice of the Western Metals Co. the tube-mill temperature is kept below 100°C., but relatively higher temperatures are used in the Swinburne-Ashcroft and Bruner-Monde plants in England, which firms are manufacturing electrolytic zinc of a premium brand.

The several stages of this process as applied to the treatment of complex ores consist in, (1) crushing to 10 or 20 mesh; (2) tube-mill (porcelain-lined) grinding with partial chlorination; (3) tank agitation of pulp with water, steam, and chlorine gas, for complete chlorination. At this stage all metallic sulphides (iron, lead, copper, and zinc) are chloridized and sulphur is disassociated; (4) filter-press treatment to remove gangue and sulphur; (5) passing of the solution of metallic chlorides to granulated copper for gold and silver recovery; (6) passing of the solution of metallic chlorides to granulated zinc for lead recovery; (7) tank agitation with zinc oxide and chlorine gas to remove any iron and manganese present, which here becomes a by-product; (8) evaporation in vacuum-pans to dry and fuse the zinc chloride; (9) electrolysis of the fused zinc chloride for the recovery of the zinc.

In all this the substitution of one metal for another is based upon well known chemical reactions, while the granulated metals are produced from the general run of ore treated. It is calculated that theoretically one electrical horse-power, at 90% efficiency, deposits 19½ lb. of zinc in 24 hr., equivalent to 0.052 hp. per day for its production. In practice, in the Corbin plant, the actual recovery made was 14.2 to 14.4 lb. of zinc per horse-power day, or 0.07 actual horse-power per diem.

The cost of installation of the complete equipment is high as compared with other metallurgical plants, amounting to more than \$1000 for each ton of daily capacity. Thus, for the Georgetown plant of 50 tons nominal daily capacity the cost will be about \$70,000. In considering the subject of initial cost it may be taken into account that this process, in a continuous cycle of treatment, makes a bullion recovery of the metals in such a way as to supersede the several separate operations of concentration, smelting, and refining, with their attendant high costs of installation. In ores in which zinc predominates the lesser metals are figured to a zinc basis, and the cost is dependent upon that factor into the cost of the power at the point where the process is installed. Exhaustive tests have been made in determining the question of ore-supply available for the Georgetown plant. In these tests the treatment has been carried to bullion recovery, and percentage of recovery, figured on the

basis of bullion weighed out as against metal-contents determined by assay of the crude ore. Tests in the instance of the Griffith mine, representing an available ore supply of 60,000 tons, are said to have yielded a practical recovery of about 90%. The crude-ore assay, averaging several blocks sampled, gave:

| Metal. | Assay, oz. per ton. | Quotation, per oz. | Metal content. |
|--------------|------------------------|-----------------------|-------------------|
| Gold | 0.18 | @ \$20.00 | \$3.60 |
| Silver | 13.97 | @ 0.50 | 6.98 |
| | % | Per lb. | |
| Lead | 4.94 | @ 0.04 | 3.95 |
| Copper | 0.68 | @ 0.13 | 1.77 |
| Zinc | 9.00 | @ 0.05 | 9.00 |
| | | | \$25.30 |

Working out the marketability of this ore for purposes of comparison, this would, under the present smelter-schedule, require concentration to put it into a marketable product, and assuming a 25% loss in milling and a mining cost of \$3 per ton, it would leave a net profit of \$1.47 per ton. On the other hand, under contract with the Western Metals Co., the same ore, it is claimed, would admit of a return of \$6.85 per ton, which, less the assumed \$3 mining cost, leaves net \$3.85 per ton, after satisfying the charge imposed upon the ore by the owners of the process who buy the ore under special contract.

The Western Metals Co. proposes to put in mills under its ownership only, and not to make sale of the process under royalty arrangements. If not unduly delayed by the electric installation this company promises to have the Georgetown plant in commission this fall.

From the example just given it appears that with a recovery that exceeds 90% of the total metal content of the ore, the deviation of profit between producer and process-owner will be in favor of the latter. Whether such ore can be taken as representative of the general average of the Clear Creek district is questionable; a gross metal content of \$20 per ton would probably put the mark as high as could be reached in the average zinc-lead ores now available.

The Georgetown plant is destined to put to the proof a process which, while not altogether new in respect to the chemical principles used, is new in point of commercial development for a 50-ton unit, and its outcome will be watched with great interest.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

A. E. D., Columbia City, Indiana: No. 1 and 2 are samples of soft pure graphite.

F. A. F., Tehachapi, California: No. 1, obsidian; No. 2, rhyolite; No. 3, metarhyolite.

J. M. D., Atwater, California: No. 1, Porous quartz with much pyrite; No. 2, specimen of volcanic rock.

T. F. V. W., Zacatecas, Mexico: No. 1, rhyolite;

No. 2, slate; No. 3, mineralized rhyolite; No. 4, metamorphic rock.

E. D., Amos, Nevada: No. 1, massive hematite; No. 2, silicious rock stained with black oxide of copper and containing small specks of malachite; No. 3, quartzite.

L. B., Kerby, Oregon: No. 1, metamorphic quartzite with pyrite; No. 2, quartzite with pyrite; No. 3, serpentinized rock; No. 4, quartz with bornite and a malachite coating.

QUICKSILVER IN NEVADA.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM C. DAVIS.

The Shoshone mercury deposit occurs in a highly silicious rhyolite as cinnabar, some calomel, and some meta-cinnabarite. This property is in Nye county, Nevada, about 50 miles south of Austin, Lander county, in the Shoshone mountains. This range is quite heavily wooded with nut pine and 'mahogany', and contains many little streams of water. There appear to be two veins, one with a northwest strike, the other northeast. Most of the development has been done on the northwest vein. It has been prospected on the surface by open-cuts



Shoshone Retort Furnaces.

at intervals for a distance of 600 ft., by 260 ft. of tunnels, and from the tunnel level by a winze and short cross-cuts. At present much of the ore is being taken from an open-cut, 35 ft. deep. The ore is sized on a fine grizzly and roughly hand-sorted. Ore thus sorted retorts about 6% merecury.

The reduction plant consists of an iron retort, of semi-circular section, built in series of threes, with one condensing box for each series. A retort is 8 ft. long by 24 in. wide, and holds four pans 18 by 20 in. A charge consists of 36 pans, each pan containing from 100 to 110 lb. of ore. Three charges per day are run. The retorts should be kept a cherry red heat. There is almost enough lime in the ore to make it self-fluxing, so that little trouble is experienced from the sulphur affecting the pans or retorts. Before each charge is drawn, the retort is blown with air, the free sulphur being thereby oxidized to SO₂. Some of the sulphur re-unites with the quicksilver forming a dark brown sulphide. Quicksilver has been found in two other places in the same vicinity, also in rhyolite, but, as yet, no development work has been done.

The size of the charge depends upon a combination of conditions largely determined by experience, by the size of the furnace, and by the relative amounts of the various ores to be smelted. These conditions here require on the charge 300 lb. of ore 'A'; 1200 lb. of ore 'B'; 500 lb. of ore 'C'; and 300 lb. of converter slag 'D'. The assays of these ores are given on the accompanying charge-sheet, which is a copy of the original at the smelter, with the ores represented by letter instead of by name. The pounds of the silica, iron, lime, sulphur, and copper contents of the ores are computed (generally by means of a slide-rule) and entered upon the charge-sheet. In choosing a slag to be made, it is not the practice at this plant to try to make an exact singulo-silicate ($2\text{RO} \cdot \text{SiO}_2$) or other exact class slag, but to make that slag which experience has demonstrated is best suited to local conditions. This experience-dictated slag, however, approaches a singulo-silicate, and if a new and untried one were presented for treatment calculation would be made for a singulo-silicate at the start. This matter of where to begin, what assumption to make in choosing a slag, is the crux of

be left, therefore, 15% for the matte, which amounts to 59 lb. In forming matte, Cu combines with one-quarter of its own weight to form Cu_2S .

$$\text{At. wt. Cu} = 63.6 \quad \text{Cu}_2 = 127.2$$

$$\text{At. wt. S} = 32.07 \quad 127.2 \div 32.07 = 4 \text{ (nearly).}$$

The amount of Cu in the charge has been calculated to be equal to $42 + 0.02x$. The amount of sulphur required by this amount of copper is therefore $\frac{42 + 0.02x}{4} = 10 + 0.005x$ (nearly), and the amount of sulphur left to combine with iron is $59 - (10 + 0.005x) = 49 - 0.005x$. In forming the matte the sulphur combines with 1.75 times its own weight of iron to form FeS.

At. wt. Fe = 55.9

$$\text{At. wt. S} = 32.07 \quad \frac{55.9}{32.07} = 1.75 \text{ (nearly).}$$

The amount of Fe required to satisfy $(49 - 0.005x)$ lb. of S $= (49 - 0.005x) \times 1.75 = 86 - 0.009x$. The total Fe in the charge, as per the calculation sheet, is 599 lb. from ores A, B, C, and D, plus 4% of the weight of the silicious ore $x = 599 + 0.04x$. Therefore the total Fe left to go into the slag will equal $(599 + 0.04x) - (86 - 0.009x) = 513 + 0.049x$.

[illegible]

the problem when beginning on an untried ore. Lang, in his 'Matte Smelting', considers the best slag to be generally a bisilicate of lime ($\text{CaO} \cdot \text{SiO}_2$) and a singulo-silicate of iron ($2\text{FeO} \cdot \text{SiO}_2$) in equal parts. The assumed slag in the present case is $44\text{SiO}_2 : 25\text{FeO} = \text{Fe } 19.5; \text{CaO } 0.23$. The problem is to determine the quantity of dry (silicious) ore containing high gold and silver content, and 2% copper, which can be put on the charge, and the amount of lime necessary to be added. The assays of these two materials are known, and are entered on the charge-sheet. Let the required amount of silicious ore be represented by x and the amount of lime by y . The total silica on the charge is that in ores, A, B, C, D, plus 69% of the weight of the silicious ore, x , plus 3% of the weight of the lime-rock, y ; 69 and 3 being respectively the silica content of the silicious ore and the limerock. Therefore the total SiO_2 on the charge is SiO_2 in pounds $= 765 + 0.69x + 0.03y$.

In like manner the total copper on the charge is the copper in the ores A, B, C, D, plus 2% of the weight of the silicious ore. Therefore, the total copper in the charge is Cu in pounds = $42 + 0.02x$.

As shown by the computed weights on the calculation-sheet there are 393 lb. of sulphur in the charge. It is assumed that 85% will be volatilized; there will

The total lime (CaO) in the charge, all of which goes into the slag, is 69 lb. from A, B, C, and D, plus 6% of the weight of the silicious ore x , plus 51% of the weight of the limerock y . This equals $69 + 0.06x + 0.51y$. Here now are three equations which give the pounds of silica and iron, and lime in the slag:

$$\text{SiO}_2 = 765 + 0.69x + 0.03y$$

$$\text{Fe} = 513 + 0.049x$$

$$\text{CaO} = 69 + 0.06x + 0.51y$$

In the chosen slag the ratio of the SiO_2 to Fe is

$$\frac{\text{SiO}_2}{\text{Fe}} = \frac{44}{19.5} \quad \text{Therefore} \quad \frac{44}{19.5} = \frac{765 + 0.69x + 0.03y}{513 + 0.049x} \quad \text{whence}$$

$$11.25x + 0.58y = 7700. \quad \dots \dots \dots (a)$$

In the chosen slag the ratio of SiO_2 to CaO is

$$\begin{array}{rcl} \text{SiO}_2 = & 44 & 765 + 0.69x + 0.03y \\ \text{CaO} = & 23 & 69 + 0.06x + 0.51y \end{array} \quad \text{Therefore} \quad \begin{array}{rcl} & 44 & \\ & 23 & \end{array} \quad \text{whence} \quad \begin{array}{rcl} 13.26x - 21.71y = & -14,570. & \end{array} \quad \text{(b)}$$

Solving equations a and b, $x = 629$ and $y = 1056$, the pounds of silicious ore and limerock respectively to be added to the charge. Entering these amounts on the charge-sheet, and calculating the respective quantities of SiO_2 , Fe, CaO, and Cu, there is found the total charge of 3985 lb., which will contain

| | Pounds. |
|------------------------|---------|
| SiO ₂ | 1231 |
| Fe | 624 |
| CaO | 646 |

| | |
|----------|-----|
| S | 393 |
| Cu | 55 |

The 55 lb. Cu on the charge will require $55 \div 4 = 14$ lb. S for the Cu_2S in the matte. The remaining sulphur, $59 - 14 = 45$ lb., will require $45 \times 1.75 = 79$ lb. Fe for the FeS of the matte. Therefore the matte will contain

| | |
|----------|---------|
| | Pounds. |
| Cu | 55 |
| S | 59 |
| Fe | 79 |

Assuming that these elements will comprise 95% of the matte, the other 5% being substances not considered, there results 203 lb. of matte, equivalent to a matte-fall of $\frac{203}{3985} = 5.1\%$. The resulting matte will assay $\frac{55}{203} = 27\%$ Cu. The slag will contain all the SiO_2 in the charge, 1231 lb.; all the CaO in the charge, 646 lb.; the Fe in the charge, 624 lb., taken up by the S in the matte = 545 lb., which is equivalent to 699 lb. FeO.

The slag is then composed of

| | |
|---------------------------|-----------|
| | Per cent. |
| 1231 lb. $\text{SiO}_2 =$ | 43.9 |
| 699 lb. FeO = | 24.9 |
| 646 lb. CaO = | 23.1 |

which is the slag intended to be produced.

For the sake of clearness this explanation has necessarily become long, but the method and its calculation is really not only short, but also most satisfactory. At the Garfield smelter the ore is dumped into bedding-bins and delivered to the furnaces, which are run by the appearance of the slag. The lime and coke in the charge are varied, or 'dope' charges are fed, according as the appearance of the slag, to the trained eye of the smelter man, seems to indicate. It is stated unofficially by an official that it has been two years since a charge was calculated here. The method used at that time is short and consists in assuming the charge, from past experience and the amounts which must be smelted, and calculating the resulting slag.

The accompanying charge-sheet shows the actual charge and the smelter's calculations. The charge consists of 2000 lb. of bed-ore, 2500 lb. of ore 'B', 500 lb. silicious ore, 500 lb. slag, and 500 lb. lime-rock. The amounts of silica, iron, lime, sulphur, and copper are calculated and carried out on the sheet. The volatilization of sulphur is assumed at 60%. There is then left for matte 167.4 lb. sulphur. Copper in the matte requires one-quarter of its weight in sulphur, or 62 lb. Thus $167.4 - 62 = 105.4$ lb. S is left to combine with the iron of the matte. Sulphur requires $1\frac{3}{4}$ or $\frac{7}{4}$ its weight of iron to form FeS. Therefore $105.4 \times \frac{7}{4} = 164.1$ lb. Fe required. This amount leaves 995 lb. to go into slag. Since Fe is $\frac{7}{9}$ of FeO, $995 \times \frac{9}{7} = 1278.9$ lb. of FeO in the slag.

The slag has now been determined. It contains

| | |
|----------------------|---------|
| | Pounds. |
| SiO_2 | 1786.0 |
| FeO | 1278.9 |
| CaO | 909.0 |

Assuming that these form 92% of the total slag, and that the other 8% is composed of Al_2O_3 , ZnO, etc., 4319 lb. of slag result; whence the above quantities give the following:

| | |
|----------------------|-----------|
| | Per cent. |
| SiO_2 | 41.1 |
| FeO | 29.6 |
| CaO | 21.0 |

The matte will contain

| | |
|----------|---------|
| | Pounds. |
| Cu | 248.0 |
| Fe | 164.1 |
| S | 167.4 |

Assuming that these constitute 95% of the total, there is a matte-fall of 610 lb., equal to 10%. The copper in the matte is 40.6 per cent.

THE KAPSAN MINES, KOREA.

*The ore is called 'whang chol', or 'yellow iron', the percentage of copper assaying over 20% in the first-class ore, and 5 or 6% in the second-class, an average of about 10%. The following is an assay by percentage of what is considered a common kind: Copper, 12.07; iron, 45.44; sulphur, 37.40; silica, 0.66. Lead, zinc, or other impurities are totally absent.

The Japanese authorities state that this mine was discovered over 1000 years ago by a Chinese who worked it without troubling himself to obtain a license from the Korean Government. Other authorities report the mine as having been first operated by the natives less than a century ago. The natives became acquainted with the richness of the deposit and took over the workings, continuing until 24 years ago when the ownership passed into the hands of the Imperial Treasury. The mine was worked by the latter for two years, during which it was in a very flourishing condition. Then again the mine became a private concern, the Imperial Treasury placing there, for the purpose of supervision and tax collection, a commissioner, who was conditionally an official contractor holding the post on paying the Imperial Treasury a certain annual sum as the revenue from the mine. In 1904 Americans were granted the right to operate at Kapsan, but this grant, as modified, was not confirmed by the Japanese protectorate until 1908. Heretofore the native Kapsan miners have solely resorted to manual labor, using a hammer called 'machi' and a drill called 'chung', until quite recently when they learned from foreigners the use of powder and dynamite. Before the Russo-Japanese war the greater part of the output was transported to Sin Chung, the port of Puk Chung, thence to be shipped to Wonsan seaport, where it was exported to Osaka by Japanese merchants. A portion went overland to Pyeng Yang or Puk Chon to be made the material for bronze casting.

Engineers who have examined the Djin Dong (Kapsan) mine are unanimous in stating that the ore possesses an average value of 10% in copper; that the mine, although only hitherto worked by crude methods, has yielded a substantial output for many years past, and that the indications point to the bringing into existence of a somewhat large and permanently profitable mining property, following preliminary development. The engineers agree that labor is cheap, efficient, and abundant, that plenty of timber is available for mining purposes and for fuel;

*Abstract from *Far Eastern Review*.

also that the existence of a sufficient supply of water for use in providing power is uncertain.

The present workings are situated about three-quarters of a mile from the eastern boundary of a limestone. On the top of the hill above the old workings there are small bands of shale embedded with the limestone. These dip about 30° to the southeast, which is more or less the general dip of the limestone in the neighborhood of the ore deposits, though it is so disturbed and has so many dips, from horizontal to vertical, that it would be difficult to give any figures as to the true average dip of the whole of the limestone. The Japanese government engineer states that the formation of this part of the country belongs to the Paleozoic, and mainly consists of alternate strata of limestone and marl in association with clay, slate, and sandstone. Those rocks have undergone the process of the contact metamorphism by the granite which outcrops at a point over three miles northeast of the mine, the limestone being crystallized and producing tremolite. Both the sandstone and the clay slate are also more or less metamorphosed. The strata have a strike from south to north, or from southwest to northeast, and lie in folds dipping west or east. Basalt covers the folds, or forms dikes running through them. The deposit is a formation made in connection with the ejection of the basalt, and consists of chalopyrite in association with pyrrhotite and arsenopyrite, containing no quartz. As a rule the boundaries of the veins are well defined, though some impregnation is traceable.

The ore is roasted, smelted direct, without the addition of any flux, in small clay furnaces and metallic copper is produced in two smeltings. Oxidized or especially rich ore is not roasted. The first ore mined was smelted direct, but when sulphides began to be worked difficulty was experienced until the present headman came from the Kang Kyei copper mine and taught the smelters to roast the ore. The ore is roasted in small circular stalls built of blocks of rock set in clay. These are 6 ft. in diameter and 4 ft. high. Roasting lasts from 16 to 20 days up to a month. Nine cents worth of firewood is used per stall to ignite the ore. Two samples of roasted ore were analyzed as follows:

| | No. 1, | No. 2, |
|------------------|--------|--------|
| | % | % |
| Sulphur | 11.00 | 14.32 |
| Iron oxide | 65.71 | 62.85 |
| Copper | 17.00 | 13.81 |

The roasted ore is smelted direct with the addition of some matte and slag from the second smelting. This first smelting takes 24 hours. Blast is provided by a large wooden bellows worked by a crew of six men. A matte is produced, which remains in the furnace, and a slag, which is run off and thrown away. The matte and slag had the following composition:

| MATTE. | No. 1, | No. 2, |
|---------------|--------|--------|
| | % | % |
| Sulphur | 15.70 | 17.40 |
| Iron | 22.30 | 23.60 |
| Copper | 27.82 | 32.28 |

The second smelting lasts 12 hours. The matte

produced in the first smelting, the roasted ore, and furnace scrapings from the final operations are melted to form (a) a slag which runs off and is thrown away, (b) a thick, clotted slag, which is scraped out and used again in the first smelting, (c) a cake of matte, which remains in the furnace, and (d) a circular slab of metallic copper, which is melted into a rectangular bar, and shipped.

| | SLAG. | |
|------------------------|--------|--------|
| | No. 1, | No. 2, |
| | % | % |
| Silica | 22.20 | 23.60 |
| Iron Oxide (FeO) | 54.66 | 52.77 |
| Lime | 2.40 | 1.30 |
| Copper | 2.45 | 2.30 |

The smelters have each his own smeltery, where they work a set of hearths, usually employing 6 blastmen, 1 bellows carpenter, and 1 assistant. In addition to board and lodging the carpenter gets 20c. per day, the assistant 17c., and the blastmen 13c., when they do a full day's work.

The process is similar to what is called in Japan the old-fashioned 'regular blast' process. The ores are first roasted in a circular cauldron resembling a stall. The roasted ores are then treated in a 'preliminary hearth', filled with charcoal, by a hand bellows. The mattes formed in this way are removed to a 'regular hearth', where they receive a finishing treatment, being fused with charcoal and firewood. The product of this treatment is the coarse copper. No other agents are used in the preliminary and regular hearths for the fusing, but, as is common in a process of this kind, the uneleaned slags formed in the regular hearth are again put into the preliminary hearth for further treatment.

As there are so many uncertainties, chiefly depending upon the scale of operations, the process of smelting employed, and what arrangements can be made for transport, and also what amount of stores have to be brought in, only rough approximations can be given at this stage. The mining will be cheap, and also ore transport, providing smelters are erected close to the mine. The estimated total cost of smelting is \$7.50 per ton. Transport to the coast can be arranged for at \$30 per ton, which includes both carrying copper to the coast and bringing back stores.

KINETIC THEORY OF SOLIDS.

In solids the effect of cohesive forces in the molecules is more apparent than in liquids. But since there is a transition from highly viscous liquids to plastic solids, and since many solids are known to vaporize without passing into the liquid state, and since solids may diffuse through solids, there must be a similar state of motion among the particles or molecules of a solid as in those of liquids. There is, however, much less kinetic energy in the molecules and molecular cohesion is more effective. When a solid is heated the kinetic energy of the molecules is increased, the effect of cohesive forces becomes less, the tendency of the molecules to separate from the solid increases. All solids possess a vapor tension, which at ordinary temperatures may be almost negligible, but at high temperatures become considerable, as in the case of platinum.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

English in Our Technical Journals.

The Editor:

Sir—The use of the English language, as displayed in some of the special articles in our technical journals causes one to wonder whether the writers of these articles are as careless with the subjects they treat as they are with the use of the language. One might think the large majority of the members of the engineering professions half educated. Surely a set of men cannot claim to be well fitted for any profession unless they are thoroughly prepared to express themselves. Refinement of language, besides giving tone to the results of experimental work, brings the thought out in a strong, logical manner. The objection that the technical schools cannot spend so much time on English composition might be well taken; but does this argument furnish a good excuse for the badly prepared technical man? There is certainly no excuse for any well educated American being unable to use his own language in such a manner that it expresses clearly all that he may wish to say.

The expression of thought in its logical sequence and relation is the purpose of language. Therefore, in the discussion of experimental data it is necessary that the thought be carried forward logically in order that the discussion itself shall not fail. It is not uncommon to see, in our technical papers, attempted compound sentences, in which the thought is completely lost in a jungle of semicolons, ands, commas, and parentheses. I have noted even the omission of the main verb. Is it possible that the writers of such badly composed sentences think clearly? There is another class of technical writers who seem to fear the compound sentence. In their work one may find a lot of short disjointed sentences which make the whole a failure, because there is no progression of thought. This is the main essential.

It seems to me that absolute clearness of expression is essential to the technical man. Every engineer, I am sure, will agree with me when I say that in any engineering work it is important that every detail be thoroughly and clearly understood. It has been well said: "every man can state clearly what he clearly understands." The reverse is perhaps also true. If an engineer fails to express himself clearly regarding the details of his professional work, how can his employer be sure that the engineer himself understands clearly what he is about to do?

The fact that the educational training of many untechnical men is beyond reproach, puts the technical writer in a delicate position in case any of his work is placed before such a man. If, in a report or professional article, the thought is confused and badly arranged, the well educated layman begins to lose faith in the writer. Such men in many instances furnish the capital for engineering ventures. It is

necessary, therefore, to have their absolute confidence if the ideas of the engineer are to be adopted.

I have known engineers to send material to the publisher without rewriting or revising it. Perhaps carelessness at the beginning accounts for the appearance in print of poorly written articles. It may be that many writers depend upon the publisher to make their work presentable. The publisher in all probability has troubles of his own and cannot assume a shifted responsibility. In any case the English of our professional men must be improved. The technical engineer has the responsibility of the advancement of civilization. His influence upon contemporary and future thought must be given consideration. Therefore, in order that the engineer's thinking may fulfil its purpose, his thoughts must be expressed with refinement and precision. There is also the esthetic side to the subject. The engineer deals only with the truth experimentally proved. All philosophy teaches that truth is beautiful. Ruskin believed that truth was beauty personified. Truth proved by experiment is the hand-maiden of modern philosophy. Why dress her in rags?

W. W. STRANGE.

Pony, Montana, September 15.

Metal Losses in Copper Slags.

The Editor:

Sir—The following communication to the secretary of the American Institute of Mining Engineers, brings up a subject on which great interest centres, and it may stimulate further discussion:

R. W. RAYMOND, Secretary American Institute of Mining Engineers.

In Lewis T. Wright's paper on 'Metal Losses in Copper-Slags', read at the New Haven meeting, he starts in by saying: "It is commonly believed by metallurgists that in copper smelting the copper in the slag, which is irreducible by continued smelting, is retained in the form of 'prills' of matte." On a recent visit to Greenwood, British Columbia, I was discussing with J. E. McAllister, general manager for the British Columbia Copper Co., and the former metallurgist for the Tennessee Copper Co., this very question, and he strongly held to the idea that the copper in slag was in two forms, namely, one portion contained in occluded matte, and the other as an oxide. He believed that this rule would apply also to the silver in the slag. From my experience I am strongly inclined to agree with Mr. McAllister; and it appears quite reasonable that in furnaces treating oxidized copper ores, and to a lesser degree in furnaces treating sulphide ores, there is always bound to be present a certain amount of copper oxide and silver oxide, which will behave like any base, and get into the slag as such. We all know that in Arizona, in the early days, when it was customary to produce black copper, because the ores were nearly all oxidized (or carbonates), and sulphur was scarce, the slags as a rule carried 2.5% copper and seldom less than 1.5%. The economic point was determined by the extra coke necessary to produce the reducing action. In connection with the extra saving in copper, Arthur L. Walker, now professor of metallurgy at Columbia University, and

formerly general manager for the Old Dominion Copper Mining Co. at Globe, told me that with coke at \$60 per ton it never paid him to make slags better than 2.5% copper.

In Tennessee, when treating well roasted and presumably well oxidized ore, we seldom, if ever, had our slags contain less than 0.5% copper, yet when treating this same ore pyritically, and producing the same grade of matte, the slag would not exceed 0.3% copper. The above instances are merely cited to show that the normal tendency of copper oxide is to act like iron oxide, lime, or any other base, and to go into the slag.

If we take Mr. Wright's first example and assume a 50% copper matte, corresponding with 0.3% copper slag, which, by the way, would be pretty low, we would have the following analysis of the matte and slag:

| | Matte. | Slag. |
|----------|------------|-----------|
| Cu | 50.000% | 0.300% |
| Ag | 31.400 oz. | 0.147 oz. |
| Au | 13.950 oz. | 0.026 oz. |

If we be permitted to assume that no gold is oxidized in the slag and that all there present is contained in the matte, we can assume the 0.026 oz. as a basis, and from it calculate the amount of silver and copper corresponding to the grade of the matte produced. I have given below, in the second column, the results of this calculation:

| | Total loss. | Matte loss. | Oxide loss. |
|----------|-------------|-------------|-------------|
| Cu | 0.300% | 0.093% | 0.207% |
| Ag | 0.147 oz. | 0.058 oz. | 0.089 oz. |
| Au | 0.026 oz. | 0.026 oz. | .... |

From the above it will be seen that of the total copper contained in the slag about one-third only is lost in the form of matte, and the other two-thirds is probably in the form of oxide. Nearly the same ratio exists for the silver; and we all know that silver is easily oxidized in a furnace with a hot-top, such as is usual in copper smelting, and, while no doubt part of it is volatilized, a portion of it is ready to go into the slag. While neither Mr. McAllister nor myself have any means of actually verifying the above theory, it appears to us the simplest and most obvious solution of the problem, and much more in keeping with the facts than that the metals themselves are dissolved in the reject material from the furnaces, which is a mixture of slag, with a small proportion of matte.

J. PARKE CHANNING.

New York, October 3.

Designing Mine Equipment.

The Editor:

Sir—Some months ago there appeared in the MINING AND SCIENTIFIC PRESS one or more letters on the subject of 'Designing Mine Equipment', a subject which should be of general interest. Max J. Welch, in your issue of June 12, asks the question, 'How can the chief engineer reduce the first cost', and answers it satisfactorily on the assumption that the chief engineer is intimately acquainted with the different types of machines and the special advantage of each. But the development of machines is so rapid that probably comparatively few men have

this expert knowledge. Reliable data are, furthermore, often difficult to obtain. The trouble is not, it seems to me, in designing a particular machine, that being the work of specialists, but in choosing from among the machines offered those which are best suited to the work, and which together will make a complete plant costing a minimum and giving the highest attainable result when in operation.

In Mexico there are many small mines capable of producing 20 to 50 tons per day where the design of a plant may make the difference between success, a partial success, or even failure. The difficulty is often more acute with the small mine than with the large one, because capacity may be of less importance than recovery, and as the ores are frequently of high grade an increase of even 1% in recovery bears a large proportion to costs. To give point to the discussion, I will assume a mine capable of producing 30 to 40 tons per day, the ore requiring fine grinding and cyanidation of the resulting slime, with or without previous concentration. The probabilities are that the mine will have a limited water or fuel supply, and the choice of power is of the first importance. It may be steam, producer-gas, or electricity if available. Since a producer-gas plant costs several times as much as a steam plant of the same capacity, how shall we determine which to use? If producer-gas is to be used, how shall we choose, from the plants offered, the one which, with our Mexican labor, will do its work day in and day out? For crushing, shall we use stamps or will a Chilean mill or other grinding machine give the larger profit? In a small plant might not a Chilean mill of large capacity be able to slime the ore in one operation and thus save the cost of a tube-mill or other re-grinder? If stamps are used, is there any advantage in the individual mortar? It is conceivable that in a large mill the care of the individual stamps might offset any advantages that they may have, but in a small mill there must be more workmen in proportion than in a large mill, and this disadvantage would disappear, giving the advantages, if any, a chance to show. For re-grinding, should we buy a long tube-mill of small diameter, a short tube-mill of large or small diameter, a conical tube-mill, or a grinding pan? For filtering the slime the choice is between the leaf filters, the continuous filters, and the pressure filters. A great deal has been published about the leaf filters and very little about the others. They are more recent, and may they not have advantages not possessed by the leaf filters, particularly in elimination of loss by osmosis?

Many more questions might be suggested, but these will illustrate the subject, and will, I hope, start a discussion resulting in some interesting and up-to-date data on the subject.

BYRON E. JANES.

Santiago Papasquiaro, Mexico, October 25.

Dolerite is an old term used, according to Pirsson, to designate the granular, igneous rocks, with predominant ferro-magnesian minerals, but in which it is not possible to tell positively just what ferro-magnesian mineral is present. This group therefore includes much that is commonly referred to as diabase.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Aerolites are meteorites of stony composition and are distinguished from siderites, the iron-bearing meteorites, by specific gravity as well as by composition.

Reasonable compensation for the daily services of a horse employed in a tunnel to draw cars or at a shaft in raising ore, and the like, may be treated as labor performed in assessment work.

Pitch-blende is likely to be confused by prospectors with several common minerals. Magnetite, sometimes so confused, may be distinguished by being attracted by a magnet. Hematite may be told from pitch-blende by its red streak. Obsidian or volcanic glass, most commonly mistaken for pitch-blende, differs from it in lower specific gravity, and in having a glassy lustre and light streak.

Felsite is a term used by Pirsson for quite dense rocks, light in color, and generally highly feldspathic in character, while basalt covers dense, dark-colored, igneous rocks, for the most part ferromagnesian in character. This usage gives both of these terms, felsite and basalt, a broader meaning than is customary. For example, dacites and most andesites fall under the head of felsite.

Fixation of atmospheric nitrogen may be accomplished by three groups of methods. First, direct formation of ammonia from its elements, both of which have to be isolated for the purpose. Second, the formation of metallic nitrides and cyanogen compounds, which are subsequently decomposed into ammonia compounds. And third, those methods which aim at the direct oxidation of atmospheric nitrogen to nitrites or nitrates.

Solution, especially in water, is a factor in effecting a change of speed in chemical action, usually promoting it greatly, but not always. The most pronounced action is effected through the ionization of one or both substances. Many substances are less active chemically when dissolved in water, as, for example, sugar. Moreover, most solvents, if they effect chemical change at all, retard it.

Sulphur in coal reduces its value, and such loss to the consumer is taken into account in corrections applied to purchase price by many large consumers, such as naval and other Government departments, municipalities, and the like. As an example, the Charles River Basin Commission of Massachusetts in its specifications to bidders demands a reduction of $\frac{1}{2}\%$ per ton for every one-hundredth of one per cent of sulphur in the coal in excess of one per cent.

Barium hydrate is used as a boiler compound. When bicarbonates are present, it precipitates calcium (or magnesium) carbonate and barium car-

bonate. If any alkaline earth sulphates are present, however, barium sulphate is formed and the bicarbonate decomposed by the hydrate liberated. It will be seen in this case that instead of remaining in solution, the reagent added is itself precipitated. It thus doubles the amount of suspended matter.

An ore-bin situated on a mining claim which has been open to location for several years becomes the property of one who makes a valid re-location of the claim. Improvements on ground open to location do not necessarily always belong to the locator. The placing of structures on such ground by mistake may give the builder an equity in them, and other circumstances may cause the courts to recognize the right of the original owners and allow of the removal of the structures.

Enantiotropism and monotropism are terms often used in discussing the change from one polymorphic crystal form of a substance to another. In some instances this change takes place with great slowness upon change of conditions; in other cases rapidly. In some, the transition may take place in either direction upon change of conditions; the process is then 'enantiotropic'. In other cases the transition is only possible in one direction, from a meta-stable to a stable condition. Such a process is 'monotropic'. Quartz and tridymite are enantiomorphic forms of silica, SiO_2 . A transition point between them occurs at about 800°C . Above this temperature tridymite is the stable form; below 800° quartz is stable.

'Lode' as used in the Acts of Congress has been held to be "applicable to any zone or belt of mineralized rock lying within boundaries clearly separating it from the neighboring rock. It includes * * * all deposits of mineral matter found through a mineralized zone or belt, coming from the same source, impressed with the same forms, and appearing to have been created by the same processes." It has also been defined to be a "body of mineral or mineral-bearing rock, within defined boundaries in the general mass of the mountain." The definition of a lode must always have special reference to the formation and peculiar characteristics of the particular district where the lode is found.

Annual labor, when performed on a mining claim by a lessee who holds an option to purchase from the owner, in order that it shall apply as annual labor on adjoining claims also owned by the lessor, but not under bond, must be sufficient in quantity, must actually benefit the adjoining claims, and facilitate the extraction of mineral therefrom. To remove all doubt as to the question of crediting such labor to the adjoining claims there should be an agreement between the lessor and lessee that the lessee shall perform such labor for the purpose mentioned, and this may be one of the considerations of the lease and bond. Where B and C own two claims and A has a half interest with B and C in a third contiguous claim, they may agree that all of the assessment work for the three claims may be performed on one of the claims.

Special Correspondence.

BRITISH COLUMBIA.

Boundary District.—B. C. Copper Co. — Rossland. — Nelson Shipments.—McGillivray Creek Coal.—Crows Nest Pass.

The ore shipments from the Boundary district for the week ending October 30, and for the year to that date were as follows:

| | Week, tons. | Year, tons. |
|------------------------|----------------|----------------|
| Granby mines | 25,332 | 827,382 |
| Snowshoe group | 5,050 | 122,004 |
| Mother Lode group..... | 11,572 | 242,764 |
| Oro Denoro group..... | 880 | 5,130 |

It will be noticed that the Snowshoe made a new record in last week's shipments, surpassing the former high-shipment mark for the week ending August 21 by over 620 tons. The Mother Lode gained about 200 tons over the high shipments of the previous week, while the Granby dropped a couple of thousand tons, owing to the breaking of the electric hoist at the Victoria shaft, and to the holiday for Thanksgiving day. The seven big furnaces at the Grand



British Columbia.

Forks smelter during the week treated 25,866 tons of Granby ore, breaking all former records.

The grading for the spur to the Phoenix Amalgamated group of the Consolidated company has now been finished, and the laying of steel will soon be under way. Shipments will be started to the Trail smelter as soon as this spur is in and things in running order. Work is to be started immediately on the extension of the Canadian Pacific railway from Phoenix to Wellington camp, where there is a heavy tonnage of ore awaiting shipment from the Jack Pot group, controlled by the B. C. Copper Co. This company is now about to make shipment of a 500-ton lot of Jack Pot ore as a test. This lot of ore will be teamed to the railway, and from there sent to the Greenwood smelter. In view of the increased tonnage now being received from its main mines, and of the future tonnage from the Jack Pot group, and the New Dominion mines at Phoenix, the B. C. Copper Co. is about to add increased smelting facilities to its Greenwood plant. It owns nearly 132,000 shares of stock in the New Dominion Copper Company.

The New Dominion Copper Co., through its Phoenix agent, John Seward, has paid up the old miners' wage-debt of the old Dominion Copper Co., amounting in all to about

\$20,000. Work is now under way tending toward an early resumption of mining operations. The Argo adit at Greenwood is now in over 200 ft., and penetrating a mineralized zone of good promise. It is planned to drive this adit 3000 ft. into the mountain, on which are several partly developed veins of gold-silver ore. The Hedley Mining Co. is going to add a steam plant to its water-power plant at Hedley, and with the hydro-steam power it will not be necessary to shut down when water is scarce, as in past years. The air-compressing plant will also be equipped for hydro-steam power. The Princeton Mining Co. will shortly make a series of test shipments to the Granby smelter, now that the Vancouver, Victoria & Eastern railway is completed to Princeton. The ore is low-grade and self-fluxing.

The ore shipments from the Rossland district for the week ending October 30 and for the year to that date were as follows:

| | Week, tons. | Year, tons. |
|--------------------------------|----------------|----------------|
| Centre Star group..... | 4,130 | 150,913 |
| Le Roi mine..... | 735 | 8,225 |
| Le Roi No. 2, Ltd..... | 420 | 25,062 |
| Le Roi No. 2, Ltd. (milled) .. | 225 | 12,795 |

It is gratifying to note that the Le Roi mine has again appeared on the shipping list, no ore having been sent from the mine since March 13 until the 21 carloads last week went to the Trail smelter. Shipments will not be up to the standard of the mine, nor steady for awhile, but will be sent to the smelter to avoid storage and to help pay the cost of development now going on in the lower levels of the property. Most of the ore shipped last week came from the lower levels of the mine where the gold predominates, and it is expected that the returns will be substantial. Part of the ore should assay from \$60 to \$70 per ton. With the advent of autumn the ambitions of the lessees have sunk somewhat, with the result that little or no work is going on at the smaller mines around the camp. At the Fife mines foundations and buildings are under way for the reception of the 100-hp. steam and air-compressing plant recently bought.

The ore shipped and milled in this district for the week ending October 30 and for the year to that date was as follows:

| | Week, tons. | Year, tons. |
|------------------------------|----------------|----------------|
| Blue Bell | 143 | 4,007 |
| Blue Bell (milled)..... | 900 | 42,368 |
| Cork | 21 | 448 |
| Emerald | 71 | 1,095 |
| Granite-Poorman (milled) ... | 250 | 10,168 |
| Kootenay Belle | 3 | 3 |
| Kootenay Belle (milled)..... | 70 | 2,873 |
| Nugget (milled) | 110 | 5,373 |
| Ottawa | 38 | 464 |
| North Star | 217 | 1,628 |
| Molly Hughes | 22 | 273 |
| Queen (milled) | 420 | 16,720 |
| Rambler-Cariboo | 15 | 1,010 |
| Richmond-Eureka | 150 | 1,864 |
| St. Eugene | 555 | 17,775 |
| Silver Cup | 71 | 1,099 |
| Second Relief (milled)..... | 145 | 6,221 |
| Whitewater | 95 | 1,185 |
| Whitewater Deep (milled).... | 700 | 30,900 |
| Yankee Girl | 98 | 1,742 |

The Richmond-Eureka property of the Consolidated company shipped 150 tons of \$45 ore last week, after an absence from the list of shippers since July last. Rand Bros., of Vancouver, owners of the Dundee mine, Ymlr, are going to install a compressor and power-plant on that property and drive a long adit to tap the lead and upper workings at depth. A strike of free gold was made during the week on the Harold & Winne property, west of Erie. The Canadian Marble Works is now operating a force of 75 men and shipping 10 to 12 cars of first-class marble per week. A wagon-road will be built from Creston to Bayonne camp in the spring, when it is expected shipments of ore will be made from the Bayonne group, Montana, Summit

Bell, and Smuggler. On the Echo group of six claims in this district a small force is now at work. The ore assays as high as \$80 per ton. An up-to-date steel tippie is being built by the McGillivray Creek Coal Co., Carbondale. The company is shipping 150 tons per day, but is installing a plant to handle 6000 tons per day when the long entry is through. Substantial stone buildings are being erected by the company for machine shops and power plant. J. K. Cram, former engineer of the Centre Star group, Rossland, has resigned, and gone to Carbondale to take charge of the McGillivray company's property. L. A. Campbell, of Rossland, manager for the West Kootenay Power & Light Co., has been made a director of the company. It is expected the output of this company by the end of the year will be nearly 1000 tons per day. Approximately \$175,000 has already been expended on the property. The coal situation along the Crows Nest Pass is becoming better as the cold weather approaches. There is, however, a slight shortage of cars, which is somewhat of a drawback. The International Coal & Coke Co. is shipping 2500 tons per day.

TORONTO, CANADA.

New Goldfields. — Break in Stocks. — La Rose. — O'Brien Case. — Lands in Gillies Limit. — Government Peat Plant.

The Ontario Department of Mines is at present devoting considerable attention to the gold discoveries which have been reported from time to time in the region lying 40 to 50 miles south of the line of the Grand Trunk Pacific, and about 400 miles north of Toronto. The finds are in the neighborhood of the Temiskaming & Northern Ontario railway, which runs through this region in a northwesterly direction. For some time there has been a movement of prospectors from the northern towns and settlements, and many claims have been staked. Officials who have visited the field report that the discoveries are promising so far as the surface conditions are concerned, though the important question as to whether the gold continues in depth cannot now be decided. The principal staking is being done in the region around Porcupine lake in the townships of Tisdale and Whitney. Here the gold quartz is found in dikes, one of which has been traced for several hundred feet with a width of 60 ft. Free gold occurs in considerable quantities, and assays from sample crushings run as high as \$200 per ton. Other localities where gold-bearing quartz has been found are an area in Cody and Macklem townships bordering on Night Hawk lake, and another lying some 12 to 15 miles east of McDougall's falls on the T. & N. O. railway, embracing portions of the townships of Beaty, Munro, Hislop, and Guibord. Everything points to a big rush for this field followed by a boom in mining flotations early in the spring, but the prudent investor will remember Larder Lake and not put too much trust in reports of big strikes and sample assays.

Market conditions of late, even as regards issues of undoubted intrinsic value, have been anything but encouraging either to speculators or investors. The slump in Cobalt stocks has been almost continuous, the break in La Rose having apparently affected the entire list. The most unaccountable feature of the situation is that the operations of the market are not apparently affected by actual mining conditions. Big strikes and heavy ore shipments make no difference. During the two weeks ending October 23 while La Rose was steadily depressed the mine shipped a total of 447 tons of ore. The annual report of Mr. Watson, the general manager, shows a gross value of ore reserves on May 31 amounting to \$2,626,937, as against \$2,691,736 the year before, the slight decrease being due to the fall in the price of the metal. As Mr. Watson points out, much sinking and development remain to be done before the Lawson and other outside properties contribute materially to the total of ore production. The property is now under Canadian control, a majority of the new directorate being Montreal men. Coniagas has resumed the payment of dividends at the regular rate of 3% per quarter. The July dividend was passed, the money being needed to complete the concentrator. The shareholders of the Little Nipissing at a meeting held here on October 20 endorsed the recommendation of the directors

to increase the capital by \$500,000. Half the new shares will be offered to shareholders at 20c. per share. The Provincial mine, now operated by private owners, bids fair to make good. An orebody has been found at the 125-ft. level assaying about 1000 oz. per ton and diamond-drill tests have shown good results at 198 ft. At the Shamrock mine a rich vein 5 in. wide carrying native silver assaying 2000 oz. per ton was recently struck at the 200-ft. level, and shortly afterward another 4-in. vein was struck. One of the new veins on the Nipissing, No. 114, on being further uncovered widened to 6 in. carrying plenty of native silver. It will be reached underground by cross-cutting from vein No. 26 about 100 ft. distant and is expected to add largely to the output. The management of the Temiskaming has decided to sink from the 300 to the 400-ft. level. Good progress is being made with the installation of the new concentrator and only high-grade ore is being shipped. The shaft on the Waldman is down 85 ft., and the cutting of a station has been started at the 75-ft. level, where it is expected that a vein that dipped at a depth of 60 ft. in the shaft will be cut. Eight tons of ore have been sacked.

The peculiar ways of the Ontario Government in dealing with disputes between mine-owners are illustrated by the O'Brien mine case, which is recalled by the final payment made to the Alpha Mining Co. by the Government of \$100,000, the balance due of the amount of \$130,000 to be paid in settlement of its claim to the O'Brien property. The Alpha disputed the title of the O'Brien company, alleging a prior claim. The Government took the ground that if the O'Brien title was defective the lands should revert to the Crown, and induced the parties to accept a settlement, under which the O'Brien company was confirmed in its title, but subject to a royalty of 25%, and the Alpha company was to receive \$130,000 to be paid them out of the royalties collected. The last of this has just been paid over and the Government has in addition collected \$327,000 in royalties from the mine. The next sale of mining lands in the Gillies Limit will be subject to a new condition. Purchasers of the 1100 acres now offered must agree not to sell or dispose of their holdings to any corporation other than one chartered under the laws of Ontario, otherwise the patent is to be void. The reason is that previous purchasers have obtained Dominion charters giving them much wider powers than the Provincial Government is disposed to grant.

Eugene Haanel, of the Department of Mines, has installed the new government peat-briquetting plant at Alfred, Ontario. It was designed by A. Anrep, Sr., of Sweden, and erected under the superintendence of his son. It will be put in full operation next spring and will give employment to about 300 men.

Attention has recently been attracted again to the occurrence of tin ore near New Ross, Lunenburg county, Nova Scotia, and prospecting is now being carried on under the direction of Phil H. Moore. Tin was reported from that vicinity as early as 1868, and since 1906 considerable effort has been made to discover workable deposits. In 1907 the field was studied for the Canadian Geological Survey by E. R. Faribault, who reported that the Reeves tin deposit is a pegmatite segregation in the ordinary light gray granite of that region. Feldspar constitutes the greater part of the dike. Large quartz crystals, fluorite, tin ore, and other associated minerals occur in zones about the middle of the dike, in feldspar generally much decomposed. There is no well defined foot or hanging wall. The strike of the dike is N. 65° E. The dip is to the northwest and varies from 75 at the surface to 60° at the bottom of the pit. At the outcrop the dike was about 8 ft. in width and 12 ft. in length, but development shows that at one end at least it extends farther to the northeast under a cap of granite. The deposit is probably the result of deep solfataric action, and it should extend to a great depth. The results obtained so far should be considered satisfactory and they warrant much greater development.

The tin discovery has led to a good deal of prospecting in the vicinity of New Ross, with the result that several pegmatite, porphyry, aplite, and quartz dikes bearing economic minerals have been discovered.

KALGOORLIE, WESTERN AUSTRALIA.

Settlement of Labor and Water Prices.—Powder Wrappers.—Institute of Mine Surveyors.—Great Fingall.—Gas Engines. —August Output.

Two matters of much moment to the mines on the Golden Mile have been settled for another three years, namely, the wages agreement between the Chamber of Mines and the combined Labor Unions, and the price of water from the Government. Both agreements have been signed for three years. The wages remain as they were, which is satisfactory to all concerned. After a conference between the Mines' Water Trust and the Government, the latter has agreed to let the Trust mines have water at \$1.68 per 1000 gal. for ordinary uses, and 32c. per 1000 for sluicing away mill residue, the former price being in advance of 48c. per 1000. This will bring in about \$200,000 extra revenue annually for the scheme, but still there will be a large sum to be made up from the State's revenue for the sinking fund. Some few months ago at a meeting of the Chemical, Mining & Metallurgical Society of South Africa, it was suggested that the wrappers on explosives, as well as the explosives should be of some special color, so as to distinguish unexploded charges from the ore or rock. In Kalgoorlie it often happens that charges do not fully explode, and the powder goes to the mills with the ore. Now and again Griffin mills and other machinery have been damaged by the explosions. So far no accidents have occurred underground in handling rock mixed with explosives, but narrow escapes have been reported. The Chamber of Mines here has suggested to the manufacturers of explosives that they might wrap their products in some bright colored paper. They are now experimenting to find dyes that would be easily distinguishable from the ore, and yet have no effect on the explosive.

The Kalgoorlie branch of the Australasian Institute of Mining Engineers meets once a month now, and some interesting papers are discussed. The best known surveyors in this State have formed an Institute of Mine Surveyors, the idea being to get Government certificates for the members so as to give them legal status as qualified mine surveyors, to secure uniformity of practice among mine surveyors, to advise on the training of surveyors, and to discuss professional questions. This is certainly a move in the right direction, especially where so many are following this profession. In the Chamber of Mines Monthly Journal is an interesting article by the manager of the Great Fingall mine, on stopping the flow of water from a bore-hole and surrounding country by pumping in first sawdust and then cement, the result being that the entire flow ceased. This system of stopping leaks by pumping in cement has been very successful in America, according to all accounts.

Good results are reported from development in the Great Boulder, Ivanhoe, and Golden Link at 2500, 2120, and 500-ft. levels respectively. The Great Fingall is not so good again in the winze below level 14.

The use of gas engines in Western Australian fields is steadily increasing, although at present there are only a few hundred horse-power in use. Wood for steaming purposes is getting scarcer and dearer. Good charcoal can be made out of the local wood, and suction-gas plants are working here costing about 1.5c. per horse-power. This is cheap work; and so far the engines have given little trouble.

The August gold output from the State was valued at \$2,540,000. The principal mines produced as follows:

| Name. | Tonnage. | Value. | Profit. | Dividend. |
|--------------------------|----------|-----------|----------|-----------|
| Associated | 11,645 | \$105,000 | \$30,000 | ..... |
| Asso. Northern Blocks.. | 3,770 | 30,000 | 10,500 | ..... |
| Golden Horseshoe | 25,291 | 253,000 | 100,000 | \$375,000 |
| Golden Ridge | 2,320 | 29,000 | 14,000 | ..... |
| Gt. Boulder Proprietary. | 18,722 | 250,000 | 130,000 | ..... |
| Gt. Boulder Perseverance | 19,692 | 146,000 | 35,000 | ..... |
| Great Fingall | 11,030 | 73,000 | 7,500 | ..... |
| Hainault | 5,554 | 38,000 | 6,500 | ..... |
| Ivanhoe | 19,686 | 205,000 | 100,000 | ..... |
| Kalgurli | 10,780 | 140,000 | 78,000 | ..... |
| Lake View Consols..... | 10,600 | *75,000 | 13,000 | ..... |
| Lancefield | 6,821 | 57,000 | †1,000 | ..... |

| | | | | |
|-------------------------|--------|----------|--------|-------|
| Oroya-Brownhill | 11,622 | *104,000 | 38,000 | ..... |
| Oroya-Black Range | 4,620 | 58,000 | 20,000 | ..... |
| Sons of Gwalia..... | 13,423 | 110,000 | 39,000 | ..... |
| Sons of Gwalia South... | 2,030 | 22,000 | 5,000 | ..... |
| South Kalgurli | 9,949 | 62,000 | 14,000 | ..... |
| Westralia Mt. Morgans.. | 5,134 | 27,000 | ..... | ..... |

*Return includes yield from re-treatment of dumps.
†Loss.

NEW YORK.

Copper Shares and the Copper Combine. — La Rose.—Ely Stocks.—
Union Copper —Guanajuato Consolidated.

The copper situation has developed into one of extraordinary interest. Some heavy sales of copper have been made by the United Metals Selling Co.; sales of sufficient magnitude to affect the present surplus to a marked extent, and while the aggregate amount is not definitely known, it is anticipated that the forthcoming statement of the Copper Producers' Association will be the best the Association has been able to make this year. There has been a marked advance in Amalgamated, Butte Coalition, Greene-Cananea shares, and the prevailing tone is altogether hopeful and anticipatory of better conditions. The 'copper combine' has been the subject of almost endless discussion, and it is evident that matters are taking form as rapidly as possible. The announcement just made that two Phelps-Dodge directors are to go on the Greene-Cananea board, is evidence of the closer relations existing between the Cole-Ryan and Phelps-Dodge interests. It is pretty well understood that the belligerent attitude of the Guggenheims has been overcome, and that in this one of the chief obstacles to harmonious working out of the situation has been removed. There are many explanations, theories, and denials from all quarters. In the general comment the gravity of the undertaking is hardly appreciated. Any adequate organization to protect the market for the metal or to control a major part of the production of the country must be unusually powerful. Nearly every important financial interest of the country should be directly or indirectly represented in any such combination and the magnitude of the undertaking can only be realized by those familiar with the situation. So large and important an undertaking must move slowly, but apparently progress is being made.

The annual report of the Nevada Con. for the year ending September 30 has just been made public. It shows a production for the year of 34,527,823 lb. of copper and a net profit for the year's operations of \$1,646,062. The average assay of the ore treated was 2.34% copper while the average extraction was 70.73%. Copper costs were 7.14c. per lb. or loading copper costs with all possible charges including an item for rental of the Steptoe plant 7.47c. per lb. During the last quarter of the fiscal year production was 14,265,788 lb., and the report predicts that during the coming year production will be 6,000,000 lb. of blister copper monthly. At the annual meeting of the company held at Portland, Maine, on November 2, the old board of directors was re-elected and the proposed increase of capital stock was approved; the increase being the 400,000 shares which is to be exchanged for Cumberland-Ely. The Goldfield Consolidated report mailed to stockholders with checks for the fifth quarterly dividend, while showing that the company was earning a fair margin above its dividend requirements, was not favorably received and the stock declined somewhat in the market. The shares of the La Rose Consolidated have been for some weeks the centre of attacks by traders, whose movements have somewhat mystified both stockholders and the general public. There has been selling in volume and under strong pressure, culminating in a drive this week which carried the stock from \$6 to \$4½. On Thursday the announcement was made that the board of directors after a trip of inspection and a thorough examination of the properties had issued a statement that the dividend would be cut from 16 to 8%. It is quite evident that there was some inside selling before the announcement was made public. Had it not been for some investment buying by the outside public the market demoralization would have been much greater. The directors

explain that it is their intention to build up a cash reserve with which to more broadly develop the property. It is also reported from inside sources that the Lawson 'silver sidewalk' fails to hold grade at the 100-ft. level. Market-wise, the Ely (Nevada) stocks continue to hold the attention of the traders. There has just been a setback in the market campaign in Ely Central, which is built upon spectacular advertising. The stock sold last week as high as \$4, which, on the company's \$16,000,000 capital, is on a basis of \$6,400,000 for the property. Taking into consideration the fact that all that Ely Central will have to spend upon development is the proceeds of a bond issue of \$600,000, said to be already underwritten below par, recently provided for by an increase in capital stock from \$12,000,000 to \$16,000,000, the bonds to be convertible into stock at \$1.50, it would appear to say the least, that the recent market price was quite unwarranted by any conservative analysis of the situation. Union Copper Mines, of malodorous memory, is evidently preparing to repeat, if possible, its performance of some years ago, when a scandalous manipulation of the stock culminated in the bursting of the bubble after the shares had been forced upward from \$1 to \$42 per share. Some reports made ten years ago are being revamped and the names of eminent engineers are being mentioned in connection with present



Guanajuato, Mexico.

efforts to bring the shares into public favor. Quotations are ranging around \$4 per share and active trading is maintained to entrap the gullible market followers who are more interested in quotations than in mine valuations. Recent results in the Guanajuato Consolidated mill are said to have a tendency to show that close concentration as practised there will almost justify letting the tailing run into the river instead of maintaining and operating the company's large cyanide plant. Parish MacDonald is said to have remarked the other day that if it came to the question of equipment of a similar property it is doubtful whether a large cyanide plant would be advisable. A small re-grinding and cyanide plant, it is said, might be profitable for treatment of the slime. The Guanajuato Consolidated is reported to be putting in Diester concentrators. These are said to be making a good saving and to reduce the silica by 2% over previous standards.

MEXICO.

Oil War.—Taviche Shipments.—Zinc Ores and Smelting.

The oil war between the two great rival oil powers in Mexico, the Waters Pierce and the S. S. Pearson interests, has been going on for a long time, and has reached the amusing stage of almost daily bulletins in the press, where each company candidly states that it is selling below cost, with the hope of eventually driving the other competitor out of the field, and freely advises the general public to buy all the oil that it can while prices are low. In some advertisements the public is advised to buy from the rival, it being pointed out that the more the rival sells the sooner will it have to go out of business. It is the generally accepted opinion that the Waters Pierce, the Standard Oil, and the Harriman interests in Mexico are all closely allied,

and that the S. S. Pearson interests control the greatest extent of the Mexican oil-fields. There is a tariff against the importation of crude oil if it is to be refined and sold in the country, but oil can be imported free of duty and refined in bond, provided it is exported again within a year. There are frequent rumors that the oil-fields of Mexico are not as good producers as reported, and that a great deal of salt water is pumped up with the oil, and that there are indications that they will not be able to meet the demands. It is well known that refineries owning extensive oil-fields in Mexico have been forced to import large quantities of crude oil for lack of supplies of proper quality and in sufficient quantity from their own wells. During the drilling of a deep well for the Harriman interests a 2½-in. drill-stem was twisted off, when the well had reached a depth of 3800 ft. As soon as the broken piece can be removed, drilling will be continued until the well reaches 4000. No oil has been struck since the first slight flow of several months ago. When finished this will be the deepest hole in Mexico. Oil-well drilling has been making good progress close to the mouth of the Topola river, 30 miles from Tampico, under the control of the Mexican Fuel Co. Charles Nelson is in charge of operations. He is considered one of the most experienced drillers in the country. Oil was found at 2450 ft. and 6 ft. of oil-bearing sandstone was drilled through and cased off; the oil was of 17° gravity. Following this an 8-in. stratum of hard-pan was drilled through, and a second bed of oil-bearing sandstone was cut, which yielded high-grade oil. As a result of the indications so far found it is thought that this well will prove one of the best producers of Mexico. The Mexican Fuel Oil Co. is drilling on land near the Tamesi river. Well No. 2, which was recently brought in, has a depth of 1150 ft., and the oil is of about the same quality as that from the Ebano fields, with a specific gravity of about 11° Beaumé, and a flash point of 198°F. As considerable pressure has developed, the well has been closed with a valve. The product has been contracted for by the Waters Pierce Oil Co., which will build a pipe-line 2500 ft. from the storage-tanks to the Tamesi river, from which point it will be conveyed by barges to the company's refinery at Tampico. The Mexican Fuel Oil Co. owns about 13,000 acres in the district.

The Pearson interests have struck good oil at the Camp Tumbadero fields near Tuxpám. The well was drilled through the asphalt belt; this was cased off, and then came over 1000 ft. of shale, and under the shale petroleum, with a paraffine base, was encountered. It is of a good quality and of yellowish brown color. There is not sufficient pressure to cause a flow, and so the well has been capped and another will be drilled in the immediate vicinity.

It is reported that over 1,000,000 acres of oil-bearing lands in the State of Tamaulipas have been bought by California capitalists. The tract is known as the Rancho Limón, the purchase price is said to be \$2,500,000 United States currency. Part of the Tampico division of the National Railroad runs through the property, and the railroad stations of Las Palomas, Rodriguez, Cocos, and Auza, are all within the territory. Added to this the Panuco river is within reach, and is navigable for light-draught boats at all seasons. There will be no lack of shipping facilities for the products, and Tampico and the Gulf ports can easily be reached. It is stated that a large number of oil seepages are known to exist on the property and that drilling operations will be started at once.

Owing largely to the cessation of the rains, but also to the improved grade and quantity of ore taken out of the San Juan mine, there has been a considerable increase in the total amount of ore shipped from Taviche during October. It is also reported that ore will soon be shipped from The Ocotes mine of the Teziutlán Copper Mining & Smelting Co. which is situated at Ejutla. This mine is the second largest in the State and has not been shipping ore for nearly two years.

The smelters are being affected by the curtailment of the amount of ore shipped. This is due largely to the increased milling facilities, and to the success obtained in treating the low-grade ores by concentration and cyanide. The decrease in the shipment of dry silver ores is also due to the

low price of silver. It, therefore, looks as though the smelters will have to re-adjust their charges, and silica will no longer submit to be penalized as it will be needed for flux. Parral, which was the largest producer of silicious ores in the north of Mexico, is now treating nearly two-thirds of its output in mills, and as soon as the Palmilla mill is erected, very little silicious ore will be shipped from that camp. This mill will have a capacity of about 1000 tons per day. It also looks as though the smelters may engage in a rate war, as the Velardeña concern has offered a flat rate for freight and treatment-charges on all ores shipped from Guanacevi, which will in part meet the demand made by mining men for concessions by the smelters in regard to silica-charges, which now amount to 20 centavos for each 1% of silica. This sometimes works out as high as \$8 to \$12 per ton, which is an absolute bar to the development of low-grade properties.

The American Zinc Extraction Co., operating mines on the Cerro de la Cruz, at Parral, is now sinking a new 3-compartment shaft. The mouth of the shaft is at a slightly higher elevation than either the main railroad track, or the mill, and is distant about 150 ft. from the former and 600 from the latter. Three new Huntington mills have been already erected and a complete new plant of the Elmore flotation process is being added to the concentration plant. It is stated that this is the first installation of the Elmore process made in Mexico. The Parral Consolidated Mines Co., operating in the same district, has nearly completed its new concentrator, which was delayed by having a carload of machinery lost in transit. José Maria Botello, who owns the Apodequeña mine, in the same locality, has started to open the property again after it has been closed for several years. Two shafts are being sunk, one of which is in shipping ore. In a former letter reference was made regarding a prospective zinc smelter to be erected at Sabinas, but the promoters of the enterprise do not seem to have been able to finance the deal. There is a new project on foot, backed by Alfred E. Rodriguez, vice-president and general manager of the Cigarrera mine in Chihuahua. Rodriguez is a representative in Congress from that State, and has the support of the Federal Government and the backing of a number of influential bankers. It, therefore, seems highly probable that he will succeed in floating the enterprise. Data have been collected, and careful estimates made, regarding the possible output of zinc mines in Mexico, and it has been decided that a smelter with an immediate capacity of 600 tons per day and an ultimate capacity of 1000, would pay well. This appears to be estimating up to the limit of possibilities. As far as is generally known the Mexican output has not exceeded 60,000 tons per annum. It is not quite plain what could be done with all the spelter that would result. It seems hardly likely that smelting could be done here so cheaply that it would pay to export the spelter to the United States or Germany. If the problem of electric smelting of zinc ores had been satisfactorily solved then there would be a real field in Mexico in view of cheap power from the hydro-electric plants. It is stated that Torreon has been selected as most suitable for the erection of the proposed Rodriguez zinc smelter, as being near the zinc mines. This raises the question whether it is cheaper to place the smelter near the coal mines, and haul the ore to the coal, or the reverse. This, like many other smelting problems in Mexico, depends not only on the relative bulk, and tonnage to be hauled, but on the direction of grade on the railroad lines and on freight rates. The coal could all be handled in bulk in large shipments and might be subject to special rates; but ore, especially high-grade ore and concentrate, comes in small lots from a number of different points, and though in the aggregate it might amount to a large tonnage, it would, according to National Railroad line charges, be subject to maximum rates. This brings up the whole question of railroad rates in Mexico, and the national policy in this regard. It is thought by some mining men that as the railroad rates, the tonnage hauled, and the income from the railroads directly affects national income, it might be worth while for the government to consider the advisability of making special low rates on certain ores.

SALT LAKE, UTAH.

Boston Con. Plans.—U. S. Smelting, Nevada.—Zinc at Good Springs.

Frank A. Schirmer, director and treasurer, and Hugh Jennings, director and consulting engineer of the Boston Con., have been inspecting the property at Bingham and the mill at Garfield. The object of the trip at this time is to learn the conditions of the mines as the year draws to a close, and make some recommendations to the directors with regard to development and improvements for the ensuing year. One of the first considerations will be the enlargement of the capacity of the mill, in order that the output may be increased. It was the original intention to erect a reduction plant with a 6000-ton capacity, but opposition was made to the adoption of the plan of A. J. Bettles to introduce stamps, instead of Chilean mills. A number of the large shareholders in the East took the position that the Utah Copper must have adopted the best method, as D. C. Jackling had conducted a series of experiments at the Coperton plant before he finally decided upon the Chilean crushers. Mr. Bettles was allowed to construct an experimental plant near the mine with five stamps. The Eastern directors sent a number of experts to inspect the workings, and it developed that for some reason a very low extraction was being obtained. At first engineers insisted that it was the fault of the mill, and it was only after repeated tests of the tailing that they were convinced that the porphyry near the surface was very low in grade. These reports caused the directorate to allow Mr. Bettles to put up the present Garfield mill, but the company decided that it should be of less capacity than originally planned. This precaution was taken as it was argued that possibly a higher-grade ore might not be found in large deposits, or that the fault might yet be found to be with the process of reduction. A change was made in the operations at the mine, and the steam-shovel work was stopped. Tunnels were run to reach the ores at greater depth, and the tally-sheets in a short time showed a higher grade of ore. The concentrate began to give a higher return from the first units of the new mill and orders were given to get the mill in position to handle an increased tonnage as fast as the ore could be blocked out. The only delay at the mill has been occasioned by failure to deliver the tonnage required from the mine. The underground workings have been extended and the consulting engineer now advises the company that the mine is in position to double its output. The recovery in the mill has satisfied all interests that one of the best processes has been adopted, and the recommendation to the directors to double its present capacity of 3000 tons is sure to carry.

Conditions at Contact, Nevada, are encouraging. During the summer, the United States Smelting Co. took a bond and option on a group of copper claims and has been developing the ground on a large scale. A few days ago a fine body of copper was uncovered, and arrangements are now being made to increase active operations. The camp is situated in Elko county, near the boundary line of Idaho, and while the extent of the copper deposits has not been determined, it is high grade, and can be shipped some distance. The railroad is within 30 miles of the camp, and will be completed during the winter months. With the assurance of a considerable tonnage of this ore, it is said that the company has decided to complete its copper furnace in Utah and ship the ore to this point. Operations in the zinc properties at Good Springs, Nevada, have been greatly stimulated as a result of the high market price for this metal. Samuel Newhouse and associates, of Salt Lake City, are heavily interested in the district, and some high-grade deposits of zinc and lead have been developed. In one property a 50% zinc and 50% lead ore is being blocked. Some of the zinc buyers have visited the district and are prepared to make a good price for the ore, but some heavier equipment will have to be installed before regular shipments can be contracted.

Copper output from the mines of Utah for October approximates 10,500,000 lb. This will be increased during November as the Ohio Copper mill will be started.

General Mining News.

ALASKA.

(Special Correspondence).—The Vermont Marble Co. has purchased the marble properties at Takeen, Marble island. George C. Robinson is in charge of the development work.—Development of the Red Wing Copper mine in the Ketchikan district is now going on under the management of C. T. Moore.—At the Moonshine Chomley, Ltd., William Rea, the foreman, reports having struck an 8-ft. vein of rich galena ore at a depth of 140 ft. Some of the samples assay as high as 1500 oz. silver per ton.—A force of men is renewing operations on the Cuprite property, west coast, Prince of Wales island. J. T. Jones is manager.—The proposed 2000-ft. adit at Seal bay is now in 900 ft. Several veins containing a good percentage of chalcopryite ore have been cut.—An ore barge sprang a leak while loading at Mount Andrew, and had to be run aground. The ore amounting to about 3200 tons will probably be recovered.—This season has not been favorable for the prospectors on account of the excessive rainfall.

Ketchikan, November 1.

The Alaska Northern Railway Co. is to operate trains as far north as the rails are laid this winter to carry supplies toward the new camp of Iditarod, as there has been a large influx of prospectors and the provisions of the camp are limited. The route from Valdez is 1200 miles while from the end of the railway it is 400 miles through a country that supplies can be hauled on sleds.

ARIZONA.

COCHISE COUNTY.

The No. 8 cross-cut on the 500-ft. level of the Shattuck-Arizona mine in the Bisbee district, opened a body of copper oxide, samples from which assayed 15% copper. A. B. W. Hodges, the recently appointed general manager, is to visit the property shortly, and it is understood that the company will again consider plans for a reduction plant.—The California & Paradise Mining Co., which recently took over the Leadville claims in the Paradise district, is to install pumping machinery at the property and unwater the inclined shaft. The company is building a surface plant and shipping in supplies. W. V. Richards is superintendent.—The Consolidated Mines Co., at Tombstone, is installing two Prescott pumps on the 800-ft. level, the combined capacity being 10,000,000 gal. per day. An accident last summer to the pumps on the 1000-ft. level allowed the water to rise to the 800, and with the former equipment it was impossible to drain the mine. W. F. Staunton is superintendent.—The October output of the Copper Queen smelter was 9,400,000 lb. of copper, and that of the Calumet & Arizona plant 4,500,000 pounds.

GILA COUNTY.

The Scorpion shaft of the Inspiration Copper Co. has cut through the carbonate zone and is now in a chalcocite ore that assays between 2.25 and 2.50% copper. It is the intention of the company to sink to the 300 or 400-ft. level before cross-cutting. A new Fairbanks-Morse pump has been installed on the 400-ft. level of the Joe Bush shaft.—The Warrior Development Co. is shipping 75 tons of 10% copper ore per day from its property in the Miami district to the El Paso smelter. The drifts on the 250 and 300-ft. levels and the raise from the 300 are all in ore of the same grade.—The Arizona Commercial Copper Co. is shipping 20 tons of matte per day to the Old Dominion plant. The county surveyor is making a preliminary survey of a wagon-road from Globe to Copper Hill, and the spur of the Gila Valley railroad to the latter place will be completed by the end of the year.—The winze on the fifth level of the Gibson Copper mine, at Gibson, opened a 6-in. vein of high-grade ore.—The Tonto River Mining Co. has resumed work at its property 70 miles north of Globe and is shipping in supplies from that point.

MOHAVE COUNTY.

In the monthly bulletin issued by the management of the Golconda zinc mine, the production for October is given as

800 tons of ore, estimated at \$18,000, shipped to the smelter, and about 1000 tons of milling ore placed on the dumps. The expenses, including all costs of development, amounted to approximately \$10,000, leaving a net profit of about \$8000.—At the Expansion mine, in the Union Pass district, six miles from Goldroad, foundations for the three 40-ton cyanide tanks are nearly completed, and three of the six stamps for the new mill are in place. The air-compressors are being moved and will be housed with the mill. At the Tragedy group, adjoining, the adit is in 260 ft., and has cut several stringers of quartz.—The shaft at the Gold Bug mine, in the Weaver district, is down 500 ft. A station will be cut at that level, and a drift run to the ore-shoot.—A. L. White, D. S. Richards, and Walter Fellows, have secured a bond on the Midnight property near Chloride, and will commence development at once. Mr. Fellows will be in charge of the work.

PINAL COUNTY.

The drift in the Argosy workings of the Vekol mine, at Vekol, opened a shoot of rich ore estimated to contain approximately \$50,000.—The shoot on the 300-ft. level of the Copper Creek mine, 14 miles east of Mammoth, was intersected by the cross-cut on that level. On the 200 it was



Power Plant, Copper Queen Mine.

50 ft. wide all being a good grade of ore from which several shipments were made. A shipment from the 300 will be made shortly to test the commercial value of the ore.—The Development Company of America has purchased the property of the Saddle Mountain Mining Co., and a large interest in the London-Arizona company at Saddle Mountain, and will commence work on the properties at once. The company will try to have the properties in such a condition that shipping can be started to the smelter at Sasco as soon as the Phoenix & Eastern railroad is completed. The deal includes over \$1,500,000 worth of property upon which a large amount of development has been done. W. J. Martin will manage the affairs of the company at Saddle Mountain and Charles E. Finney at the London-Arizona.—Development will be started on the London Mountain group shortly. There are 53 claims in the group which is controlled by E. B. O'Neill.

YAVAPAI COUNTY.

M. J. Nolan, administrator of the Farley and guardian of the Kay estate, granted an option on the Farley and Kay claims in the Columbia district to Harry G. Brown, W. D. Achauer, and Charles K. Mellon, for two years. There are nine claims in the group upon which a stamp-mill has been erected. This will be put in good condition and the ore crushed to ascertain the most advantageous method of treatment. The property has a good record in the past, while the ore crushed was taken from the oxidized zone.

CALIFORNIA.**AMADOR COUNTY.**

The management of the Rhetta mine, near Plymouth, shipped 280 lb. of high-grade ore to the '49 Rush, at Stockton, for the mineral exhibition and two tons to the Selby smelter.

INYO COUNTY.

(Special Correspondence).—The attachment for \$7832 against the mines and smelter of the Four Metals Co., at Keeler, has been released by order of the court, the company having given bonds to cover the amount. It is currently reported that the Four Metals Co. has effected a consolidation with the Western Ore Purchasing Co. Steady shipments of bullion are being maintained. In the Cerro Gordo mine high-grade ore has been opened from the 600 to the 1000-ft. level.—The Gray Butte company is opening a 6-ft. body of milling ore. George E. Austin is superintendent.—The Skidoo management reports the improvement of the main vein with depth. The mill is running steadily.—At the Keane Wonder the copper content in the ore continues to increase with depth. This property is the largest producer in the county, keeping the 20-stamp mill steadily in operation.—At the Bishop Creek several bodies of milling ore are reported in the shaft. Assays are reported to run from \$10 to \$250 per ton.—It is announced that the Virginia & Truckee railway will be extended through the mineral districts of Inyo and Mono counties. This will enable a large number of low-grade properties to operate.—The Tecopa company is shipping steadily to Utah smelters. Developments in the Gunsight and Noonday mines continue satisfactory. There is apparently no ground for the continued report that this company is about to acquire the Needles smelter, as the management is understood to be considering the erection of a reduction plant near the mines.

Bishop, November 5.

LOS ANGELES COUNTY.

The Los Angeles Chamber of Mines has received notification from a number of the railroads that the Pacific Freight Tariff Bureau has been instructed to include in the next tariff a provision granting a free rate on all ore and oil specimens consigned to the Chamber from points on their lines, and intended for exhibition purposes. This free rate is now effective on some of the lines and will become effective on the others within a short time. The following railroad companies have granted the concession mentioned: Southern Pacific company, and all connections, including the Southern Pacific lines of Mexico; the Santa Fe and connections, including the Tonopah & Tidewater and the Bullfrog-Goldfield; the Tonopah & Goldfield; El Paso & Southwestern, and the National Railways of Mexico; also the Salt Lake route.

NEVADA COUNTY.

At the Giant King mine, near Washington, the lower adit is expected to cut the vein in a short time. This will give the company 900 ft. of backs on a vein that is 100 ft. wide in places. The mill is running steadily and the capacity of the compressor plant is to be doubled in a short time.—A new road is being graded from the Emigrant Gap highway to the Yellow Metal mine at Bowman's dam, to bring in the supplies for the new mill under construction at the property.—The large station pump at the 1250-ft. level of the Prescott Hill mine, near Grass Valley, has been moved to the 1750 and drifts started on the vein. This will open a large amount of unprospected ground and give the company a chance to increase its tonnage.—A new pump has been ordered for the Kenosha mine and the shaft will be sunk below the 600-ft. level before any cross-cutting is started.

PLACER COUNTY.

W. P. Hammon has purchased the Fairview quartz claim, Crater Hill Extension, and Young Crater Hill claims in the Ophir district from Louis Kittler and E. C. Turner, and it is understood that a 10-stamp mill will be erected on the property.

SHASTA COUNTY.

The bag house of the Mammoth Copper Co. is to be com-

pleted about April 1 next year, is the statement of Fredrick Lyon to the committee from the Shasta County Farmers' Protective Association. A. S. Haskell has resigned as superintendent of the Mammoth smelter at Kennett and has been succeeded by G. W. Metcalf. Mr. Metcalf has been in the employ of the United States Smelting, Refining & Mining Co., at its Salt Lake plant, for several years.—The American mine, in French Gulch, was sold at auction to Edward Sweeney and A. J. Treat for \$20,869, that being the amount of the operating company's indebtedness.—The copper ore recently cut at the Spread Eagle group, operated by the Onn Copper Mining Co., above Copley, proved to be on top of the main orebody and an adit has been started 65 ft. further down the hill.

SIERRA COUNTY.

The vein at the Rainbow Extension property, in which a rich shoot was opened recently, has widened from 18 in. to 3 ft., all being a good grade of milling ore.—The assay office at the Rainbow mine, at Alleghany, was broken open and \$5000 worth of bullion from the last clean-up taken.—C. C. Crary and J. C. Spencer have purchased the Yellow Jacket mine, at Alleghany. Mr. Crary will be in charge of operations at the property.

TUOLUMNE COUNTY.

The management of the Manganate mine, near Jamestown, is to install power-drills at the property.—At the Republican mine the water has been lowered below the 300-ft. level and the drifts are being re-timbered and put in shape for active mining.—The power company has strung its wires to the Draper mine, at Soulsbyville, and a complete electric-power plant has been installed at the property.—Work has been temporarily suspended in the adit at the Last Chance property. This is now in 500 ft. and will require some 300 additional feet of driving to bring it under the ore found in the upper levels.—The water in the lower levels of the App mine resulting from a flow of water from the 1000-ft. level of the Dutch mine has been removed and operations resumed on the 1300-ft. level.—The shaft at the Black Oak property is being put in good condition and work will be resumed in the mine as soon as there is enough water in the ditch to develop power.

COLORADO.**LAKE COUNTY.**

The shaft at the Little Vinnie mine, near Leadville, has been re-timbered to the 430-ft. level and will be sunk to the 700-ft. level. A new compressor has been installed and surface buildings erected.—John Cortillini and associates leasing the Grand Prize property on Breece hill, have resumed work in the upper levels of the mine.—A new pumping plant has been installed at the Progressive shaft on Fryer hill.—A new plant is being installed at the Adelaide shaft. S. P. Fenton is in charge of the work.

OURAY COUNTY.

The Thistledown Mining Co. has commenced work on a dam and ditch to develop electric power for the new mill for which the company has just broken ground. The plant will generate 250 hp.—Contractors have commenced work on a new adit at the Frank Hough mine that will be 2500 ft. long when completed, and will allow the shipping of ore all winter.—The Revenue power plant No. 3 has been started and the force at the mine increased. The mine is in good condition and the production will be somewhat over 100 tons per day.

SAN JUAN COUNTY.

At the Gold Prince mine, at Animas Forks, the 40-stamp mill is running steadily and sending a high-grade concentrate to the Durango smelter.—A large body of high-grade ore has been opened at the Columbus mine, operated by W. M. Johnstone, and shipments will be sent out as long as the weather permits.—The Little Dora mill, which was shut down for a short time on account of the blockade, has resumed operations and will be turning out concentrate rapidly from now on.—The main working adit at the property of the Peerless San Juan company cut a body of rich ore several hundred feet below the old workings.—The ore-shoot which was opened on the fourth

level of the Silver Ledge mine, had been found on the third and the management plans to sink and cross-cut for the ore on the fifth level. J. B. Ross is operating the property under lease.

SAN MIGUEL COUNTY.

The Favorite Mining Co. has been incorporated to develop a group of claims in the Ophir district. The company has secured the Suffolk mill and will equip it with new machinery. A large amount of supplies has been taken to the mines for the winter and a contract let to build a 4000-ft. tram to the mill.

SUMMIT COUNTY.

The adit of the King Solomon company, at Frisco, is now in over 3500 ft., and has cut 10 veins. On No. 4 west, a drift has been run with good results, and on No. 4 east, a raise is being driven in ore.—At the Arctic mine on the Blue river, a new 10-stamp mill is nearly completed and will be in operation some time this month. There is a hydro-electric plant at the mine and the company is breaking the ground with electric drills.

TELLER COUNTY.

The progress for the month of October in the Roosevelt tunnel was 380 ft., making a total of 11,400 ft. The heading is now in the Pike's Peak granite on Beacon hill.—The production for the past month of the Trilby mines was 750 tons, approximating \$15,000 in value. The mill is now running and the output has been increased to 70 tons per day.—October proved a banner month for the Cresson Consolidated Mining & Milling Co., the output being 3500 tons. A cross-cut is being driven south on the 1000-ft. level toward the properties of the United Gold Mines Co., on Battle mountain, upon which the Cresson company holds a lease.—The 40 sets of lessees in the El Paso Consolidated company's ground shipped 2000 tons of ore in October, the average value of which was \$25 per ton.—From the main shaft of the Mary McKinney property, on Battle mountain, the Western Investment Co. shipped 809 tons of ore in the month, assaying between \$25 and \$30 per ton.—Two thousand tons were shipped in October by about 35 sets of lessees from the holdings of the Granite Gold Mining Co., the gross value of which amounted to \$56,000.—The Vindicator Consolidated Gold Mining Co. mined a total of 2800 tons which approximated \$30 per ton. Of this 1500 tons came from the 1300 and 1400-ft. levels of the main Vindicator workings, 800 tons from the Hull City shaft, and 500 from the Vindicator No. 2 under lease to Whitney & McMullen.—There are 40 sets of lessees working in the Stratton Estate properties and the combined output for the month amounted to 2000 tons of \$25 ore.—The Colorado & Pike's Peak Consolidated Mining Co. is to resume operations at its property north of Cripple Creek and may build an experimental mill to test the value of the ores.—The Pride of Cripple Creek Leasing Co., operating the Pride of Cripple Creek mine on Ironclad hill, have installed a new hoist and are constructing a new head-frame and ore-bins.—The Western Investment Co., of Victor, has secured a two years' lease on the Empire State mine on a graded royalty basis, the leasing company paying from 15 to 45% of the value of all ores marketed.—The group on Galena hill, owned by the Homestake Gold Mining & Milling Co. is to be opened to lessees.

IDAHO.

BONNER COUNTY.

The bankruptcy proceedings against the Idaho Smelting & Refining Co. have been dismissed and operations will be resumed on the construction work of the company's smelter at Ponderay. J. Herbert Anderson is president of the company.

CUSTER COUNTY.

It is reported that a stamp-mill will be erected at the Sunbeam mine at Sunbeam in the spring. Werner Ziegler is in charge of the property.

IDAHO COUNTY.

The adit at the Golden Crown mine cut a 6-ft. vein of good milling ore. John Massam is in charge of the work.—Both dredges in the Elk City district are running and will continue until compelled to close down on account of

cold weather. The machines are working on the bedrock and good clean-ups are expected.—Operations are to be resumed at the American Eagle mine on Seigel creek.

OWYHEE COUNTY.

As a result of the investigations of the engineer that examined the property of the Silver City Mining & Milling Co. for English capitalists, J. F. Cook, the manager for the company, will make a trip to London to confer with the directors of the syndicate that wish to acquire the property.—At the Banner mine, near Silver City, the company is building snow sheds from the mine to the mill to prevent any shortage of ore during the winter months.—At the Big Sugar Loaf the lower adit has cut a 4-ft. vein at a depth of 1100 ft.—Arrangements have been made to adjust the affairs of the Potosi company and work will be resumed at the property at an early date.

SHOSHONE COUNTY.

The Hercules Mining Co. has secured power from the Washington Power Co., and will operate the old Tiger mill recently leased by the Hercules management until a new mill can be built at the mine to take the place of the one recently destroyed by fire.—Work has been resumed at the face of the drift on the Mark Cooney group, near Burke. The vein was opened by a 700-ft. adit and a 100-ft. drift when operations were suspended. There is 2½ ft. of galena ore in the face and it is understood that arrangements are being made for a sale.

NEVADA.

ESMERALDA COUNTY.

An injunction was granted by Judge Farrington in the Federal District Court on November 6, restraining 35 assayers at Goldfield from buying concentrate or high-grade ore without giving notice of such purchase to the officials of the Goldfield Consolidated, Combination Fraction, and Florence companies. The statement was made by the complaining companies that over \$1,000,000 had been stolen in the past two years through the sale of concentrate and high-grade to the assay offices.

HUMBOLDT COUNTY.

Lessees operating the Mazuma Hills property in the Seven Troughs district received \$6000 from a shipment of 80 tons of ore crushed at the Mazuma mill. A pump has been installed and the mine will be opened below the water level.—At the Buckhorn mine the lessees have opened a good grade of milling ore at a number of places and are considering the joint erection of a mill to treat the ore as the haul to custom mill at Mazuma cuts too deeply into the profit.—At the Dayton lease the cross-cut has opened several feet of milling ore.

NYE COUNTY.

(Special Correspondence).—The Pioneer lease has resumed underground work and is shipping three carloads of ore, which was stored in the bins.—The Mayflower is driving from the 400-ft. level to cut a shoot of ore which was recently opened between the third and fourth levels, assaying \$50 to \$75 per ton. The shaft is being sunk from the 500-ft. point. The main object is to secure a larger flow of water for the mill.—A 2-ft. vein said to assay \$175 per ton has been cut on the 400-ft. level of the Rattlesnake property of the Bonnie Clare company. Ten additional stamps and a branch line from the Nevada-California power system have been contracted for, the entire plant of 20 stamps to be in operation by the first of the year.—An 8-ft. body of milling ore has been opened in the Signal Peak.—The shaft at the Johnnie is down 700 ft. with several veins of milling ore intersected. A 10-ft. Chilean mill has been added to the plant, which contains 16 Nissen stamps. This increases the capacity to 120 tons per day.—The Nevada-Johnnie company is sinking from the 60 to the 100-ft. levels, and will cross-cut from this point.—The Belmont mill, at Millers, has been closed several days while an ore-washer was being installed at the mine. Officials state that recent developments in the lower levels have been most satisfactory. On the 1100-ft. level the showing is exceptionally good. It is possible that the plant will be moved from Millers to Tonopah after the shaft has passed the 1500-ft.

level.—The two raises from the 300-ft. level of MacNamara are in ore and that from No. 5 stope has cut the orebody opened by the west drift.—It is reported that E. G. Wheeler and associates, of Philadelphia, are considering the erection of a large custom mill at Tonopah. It is planned to install a plant to treat the low-grade ores of the district.—A 10-stamp mill is being installed at the Tonopah Liberty and a cyanide plant will be later erected. Thomas S. Carrahan is superintendent.

Rhyolite, November 6.

STOREY COUNTY.

During the last week in October 442 cars were hoisted at the Ophir mine assaying \$42 per ton. This was taken from six different portions of the mine, 26 cars of high-grade coming from the south drift on the 2000-ft. level which accounts for the high average.—At the Mexican mine 60 cars were hoisted from the 2300-ft. level that assayed \$38 per ton, and work has been resumed on the 2100 and 2200-ft. levels.—In the Sutro tunnel repair work has been advanced rapidly, about 700 ft. of pipe having been set in the ditch.

WHITE PINE COUNTY.

The controlling interest of the Carbonate Ely Copper Co., operating in Sawmill canyon, 35 miles south of Ely, has been purchased by Jesse Knight from Charles A. Walker and Gilbert F. Boreman. There are 15 claims in the group upon which a good showing of copper with some silver and gold has been made.—The Eureka Fraction shaft, at the Ely Central, is down 200 ft., and a No. 7 Cameron pump installed. The company shipped 40 tons of ore from the Clipper claim to the Garfield smelter.—The stockholders of the Nevada Consolidated company voted for the consolidation with Cumberland-Ely, exchanging one share of the Consolidated stock for three and one-quarter Cumberland-Ely. The October production of the Nevada Consolidated amounted to 208,000 tons, all of which was handled by the Steptoe Valley plant. It is probable that the fifth unit will be added at the smelter and the total production of the consolidated properties brought up to 10,000 tons per day.

UTAH.

SUMMIT COUNTY.

At the Scott Hill property, in the Park City district, the company has started an adit 200 ft. below the level of the winze sunk on the contact some time ago. Some excellent ore was found in the winze and the management expects to open a commercial body with the adit.—Drifts have been driven 300 ft. in each direction on the vein at the 1700-ft. level of the Daly-West property, the entire distance being in good ore. It is understood that the mill will be run on three shifts in the near future, increasing the output to 600 tons per day.—At a meeting of the stockholders of the American Flag mine, at Park City, it was decided to increase the capital stock of the company and to either drain the lower levels of the mine by a connection with the Ontario tunnel or to install heavy electric pumps.—The Western Monitor company has completed a surface plant and living quarters for the men at its property in the Uintah district, and is planning the erection of a complete electric plant at the mine with a generating station in White Pine canyon.

WASHINGTON.

CHELAN COUNTY.

(Special Correspondence).—An aerial tramway, of the Northwest Iron Works make, has been installed at the Gold Eagle mine at Blewett, and hydraulic equipment has been put in for the G. H. Snowdon mine at the same place. These installations were made under the direction of George W. Otterson, of Seattle. A small mill is operating on ore from these properties. Half the gold in the ore is saved on amalgamating plates, the other half in concentrate that assays \$45 per ton. R. G. Sargent is superintendent of both properties.—The Cascade Consolidated Mining & Smelting Co. is opening a group of mineral claims that surround Doubtful lake, near the summit of the Cascades, in which they find a good grade of ore carrying gold, silver, and lead. The lake named, forms the headwater of Stehekin river,

that flows into Lake Chelan. Udo Hesse is consulting engineer and W. A. C. Rowse, of Seattle, manager.

Blewett, November 6.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The Placer Gold Mines Co., controlled by Seattle and Boston men, for which T. M. Daulton, of Seattle, is manager, operated one giant six weeks this season on Ruby creek, 17 miles from Atlin, after having finished the 4000 ft. of ditch, flume, and pipe-line, which gives 337-ft. head of water. The company's placer holdings extend from the mouth of Ruby creek up stream about 3000 yd. During the past season much of the ground was thoroughly prospected to bedrock, by sinking shafts and running drifts, showing an average pay-gravel 35 ft. deep. It is stated that portions of the ground yields \$5.75 per cu. yd. Most of this is gravel, which readily disintegrates when the stream of water at high-pressure is brought to play against it. Mr. Daulton states that he will put in a full season's work next year with two No. 6 giants, and he anticipates handling 200,000 yd. during the season. The other companies which are hydraulic mining in this



Map of Washington.

district are the North Columbia Gold Mining Co., J. M. Ruffner, manager, operating 12 giants; Pittsburg & British Hydraulic Mining Co.; Spruce Creek Hydraulic Co., William Hall, manager, operating three giants; Henri Maluen Syndicate, two giants on Otter creek; Boulder Creek Hydraulic Co., one giant, T. O'Balski, manager; Birch Creek Hydraulic Co., two giants on Birch creek, and the Guggenheim properties on Pine creek.

Atlin, November 4.

(Special Correspondence).—The Canadian-American Exploration Co., made up of Cleveland and Toronto capitalists, is developing a group of claims on Valdez island, and another on Las Queti island. The first has a contact vein between limestone and diorite, the ore being chalcopryrite, accompanied by some tellurium, assaying 4% copper and \$4.60 per ton gold. The vein is about 8 ft. wide. The second group contains a fissure vein of chalcopryrite and gold ore. The work is being done under the direction of Percy Williams, of Vancouver.

Vancouver, November 6.

ONTARIO.

The extension of vein 114 at the Nipissing property has been stripped for 250 ft. Of this, 50 ft. was high-grade ore 3 in. wide. During the winter a cross-cut will be driven to the vein from the 85-ft. level of No. 26 shaft.—The cross-cut from the 200-ft. level of the Shamrock property opened a vein of calcite with 4 in. of silver.—The Union Pacific Cobalt Mining Co. has purchased the Michigan mine which adjoins the Farah and Silver Leaf for \$240,000. Of this, \$140,000 was cash, the balance to be paid in five years. Some excellent prospects have been uncovered on the surface of the property and a shaft sunk 120 ft.—The Crown Reserve management has opened a vein of rich silver ore on the Silver Leaf ground in a cross-cut from the 100-ft. level of the Silver Leaf shaft.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. C. MENDENHALL has gone to Seattle.
 EDWARD LAUBE is at Lucky Boy, Nevada.
 M. K. RODGERS, of Seattle, has gone to New York.
 P. C. STOESS, of Seattle, was in California last week.
 H. F. A. RIEBLING, of Denver, is in southwestern Utah.
 A. E. DRUCKER has gone to London from South Africa.
 EARL R. PEMBROKE has returned to Salt Lake from Montana.
 JOSÉ MONTERO, of Guadalajara, was in San Francisco this week.
 ERLE V. DAVALER is with the Utah Copper Co. at Garfield, Utah.
 G. S. EVANS, of Silver City, New Mexico, has gone to London.
 J. M. CLEMENTS has returned to New York from the Southwest.
 J. P. KEANE, of Wallace, Idaho, recently visited Portland and Seattle.
 EMERSON GEE has returned to Los Angeles from Indianapolis, Indiana.
 G. A. SINGER, of the Gold Dredge Mining Co., has returned from Nome to Seattle.
 R. W. SHOEMAKER, recently with the Federal Lead Co. in Missouri, is in Arizona examining mines.
 V. V. CLARK, manager of the Bunker Hill mine at Reiter, Washington, has returned from California.
 ARTHUR K. ADAMS has gone to Phoenix, Arizona, as mineral inspector for the General Land Office.
 G. P. JONES is now general superintendent of the Nickel Plate mine and mill, Hedley, British Columbia.
 L. W. BARNETT, of London, who has been at the Tomboy mine, Smuggler, Colorado, has gone to Mexico City.
 ARTHUR E. HEPBURN, mining engineer, has opened an office in the Winch building, Vancouver, British Columbia.
 E. NELSON FELL and W. PELLEW-HARVEY have dissolved partnership. The name of the new firm will be Pellew-Harvey & Company.
 A. W. TUCKER resigned from the Seaboard Copper Co., in the Virgilina district, to become general manager for the Union Copper Mines Company.
 F. F. SHARPLESS has returned to New York from Colorado, where he examined the Alice mine for the Consolidated Mines Selection Co., of London.
 ROBERT LINTON, of Atwater, Linton & Atwater, has been appointed general superintendent for the Sierra Mining Co., with headquarters at Ocampo, Chihuahua.
 W. H. WEED and FRANK H. PROBERT have recommended to the Proprietary Mines Company of America the purchase of the Tajo de Dolores mine at Guanajuato, Mexico, control of which is under option to the Proprietary Mines company, at about \$1,000,000.

Obituary.

CHARLES S. NICOL died at his home at Mill Valley, California, on October 29, at the age of 79 years. He was one of the early pioneers on the west coast, going to Vancouver, British Columbia, in 1859, and was for nine years general manager of the Vancouver coal mines. He was afterward general manager of copper mines in Spain, and subsequently for the Smelting Company of Mexico, at Chihuahua. He was the first magistrate appointed in British Columbia.

Dividends.

On Thursday, November 4, the BUNKER HILL & SULLIVAN M. & C. Co. paid dividend No. 146 of \$45,000. This makes the amount of dividends paid since January 1, 1909, \$570,000, and the total to date \$11,241,000.

Market Reports.

LOCAL METAL PRICES.

San Francisco, November 11.

| | | | |
|--------------------------|------------|--------------------------|---------|
| Antimony | 12-12½c | Quicksilver (flask)..... | 50½-51½ |
| Electrolytic Copper..... | 15¼-16½c | Spelter | 7½-8¼ |
| Pig Lead..... | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|-------------|----------------------|-------|----------|-----------------|
| Nov. 4..... | 12.81 | 4.36 | 6.39 | 50½ |
| " 5..... | 12.81 | 4.36 | 6.39 | 50½ |
| " 6..... | 12.87 | 4.36 | 6.38 | 50½ |
| " 7..... | Sunday. No market. | | | |
| " 8..... | 12.87 | 4.36 | 6.38 | 50¾ |
| " 9..... | 12.87 | 4.36 | 6.38 | 50¾ |
| " 10..... | 12.87 | 4.36 | 6.38 | 50¾ |
| " 11..... | 12.87 | 4.36 | 6.38 | 50¾ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Nov. 8. | Nov. 11. |
|------------------------|---------|---------------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 9 0 | 1 8 0 ex div. |
| El Oro..... | 1 6 0 | 1 5 9 |
| Esperanza..... | 3 0 0 | 2 18 9 |
| Dolores..... | 1 8 9 | 1 8 9 |
| Oroville Dredging..... | 0 11 9 | 0 11 0 |
| Mexico Mines..... | 6 8 9 | 6 8 1½ |
| Tomboy..... | 0 19 6 | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| | Closing prices, November 11. | | Closing prices, November 11. |
|-------------------------|------------------------------|---------------------------|------------------------------|
| Amalgamated Copper..... | 87¾ | Miami Copper..... | 17½ |
| Boston Copper..... | 15¼ | Mines Co. of America..... | ¾ |
| B. C. Copper Co..... | 7 | Nevada Con..... | 27¾ |
| Butte Coalition..... | 29½ | Nevada Utah..... | 1 |
| Cumberland-Ely..... | 8¾ | Newhouse..... | 33¾ |
| Davis-Daly..... | 6 | Nipissing..... | 10¾ |
| Dolores..... | 7½ | Ohio Copper..... | 4¼ |
| El Rayo..... | 23¾ | Ray Central..... | 21¼ |
| Ely Central..... | 1¼ | Ray Con..... | 19¾ |
| First National..... | 6½ | Superior & Pittsburg..... | 16¾ |
| Giroux..... | 97½ | Tenn. Copper..... | 35¼ |
| Guanajuato Con..... | 2 | Trinity..... | 11¾ |
| Inspiration..... | 7½ | Tuolumne Copper..... | 3½ |
| Kerr Lake..... | 8¾ | United Copper..... | 8¾ |
| La Rose..... | 47½ | Utah Copper..... | 51¾ |
| Mason Valley..... | 17½ | Yukon Gold..... | 5 |

COPPER SHARES—BOSTON.

| | Closing Prices, November 11. | | Closing Prices, November 11. |
|--------------------------|------------------------------|---------------------------|------------------------------|
| Adventure..... | 4½ | Mohawk..... | 59½ |
| Allouez..... | 58 | North Butte..... | 59¼ |
| Atlantic..... | 11 | Old Dominion..... | 52½ |
| Calumet & Arizona..... | 101 | Oscoda..... | 167 |
| Calumet & Hecla..... | 665 | Parrot..... | 28½ |
| Centennial..... | 37½ | Santa Fe..... | 1½ |
| Copper Range..... | 81 | Shannon..... | 15¾ |
| Daly-West..... | 7½ | Superior & Pittsburg..... | 16 |
| Franklin..... | 16¾ | Tamarack..... | 66 |
| Granby..... | 98 | Trinity..... | 11 |
| Greene-Cananea, etc..... | 11½ | Utah Con..... | 44½ |
| Isle Royale..... | 26½ | Victoria..... | 3¾ |
| La Salle..... | 15¼ | Winona..... | 7 |
| Mass Copper..... | 5 | Wolverine..... | 150 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, November 11.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 11 | Midway..... | \$ 18 |
| Belmont..... | 72 | Montana Tonopah..... | 76 |
| Booth..... | 10 | Nevada Hills..... | 79 |
| Columbia Mtn..... | 8 | Ophir (Comstock)..... | 1 35 |
| Combination Fraction..... | 43 | Pittsburg Silver Peak..... | 60 |
| Daisy..... | 6 | Rawhide Coalition..... | 21 |
| Florence..... | 2.50 | Rawhide Queen..... | 20 |
| Goldfield Con..... | 7.05 | Round Mountain..... | 62 |
| Gold Keweenaw..... | 4 | Sandstorm..... | 4 |
| Great Bend..... | 3 | Silver Pick..... | 9 |
| Jim Butler..... | 12 | St. Ives..... | 9 |
| Jumbo Extension..... | 14 | Tonopah Extension..... | 50 |
| MacNamara..... | 29 | Tonopah of Nevada..... | 6 50 |
| Mayflower..... | 10 | West End..... | 22 |

(By courtesy of the San Francisco Stock & Exchange Board.)

COMPANY REPORTS.

BROKEN HILL PROPRIETARY.

During the half year ending May 3, 1909, the work at the mine in the Barrier Ranges silver field, and at Port Pirie, South Australia, was suspended owing to labor troubles five months out of six, so that costs were completely disorganized. Only the smelting, refining, and zinc concentrating plants ran steadily, these at reduced cost. In the report of the company there is none the less much of interest. In the European conferences of lead producers the Broken Hill Proprietary Co., Ltd., was represented by the chairman of the London board. The statement that the agreement effected specifically states that its object is "the regularization of lead prices, but not to create an artificial level," is to be noted. It is stated that the object is only "to obtain such control of the disposition of lead in such markets and ways as will maintain a regular range of prices to such extent as the law of supply and demand may allow."

CONSOLIDATED M. & S. CO. OF CANADA, LIMITED.

This company owns an important group of mines in British Columbia, including the Centre Star and War Eagle, St. Eugene, Richmond-Eureka, Phoenix, and Snowshoe (leased), together with the Trail smelter. A statement of production from these mines was published last week. In the report for the year ending June 30, now available, additional details are given. Since the company commenced operations \$1,309,731 has been expended on capital account. Shares to the value of \$656,400 have also been issued to acquire new properties, leaving \$144,800 unissued. It has therefore been decided to increase the authorized capital from \$5,500,000 to \$7,500,000. The operations for the year show a net profit of \$329,004, after writing off \$153,218 for depreciation of plant, \$16,650 sundry items, including bad debts, \$24,444 on account of cost of placing Richmond-Eureka upon a producing basis, \$563,413 charged to profit and loss on account of development, and \$56,000 to absorb loss in metal quotations. The net credit, including \$32,061 carried over from last year, stands at \$361,066. During the year additions to plant to the amount of \$164,957 have been made, land costing \$22,070 bought, and \$55,766 paid for new properties and for development, all out of operating profits. The smelter is now treating the output of the Canadian Metal Co. regularly. The gross value of the metals produced during the year was \$5,505,526, making a grand total to date of \$36,700,000.

LA ROSE CONSOLIDATED MINES COMPANY.

The production from this property for the fiscal year ending May 31 last shows a production of 6173 tons. The reported ore reserves developed are 4583. In addition are 5747 tons of rock, other than vein material, containing silver to the extent of nearly 80 oz. per ton. Thus a total of 10,330 is reached, having an estimated gross value of \$2,520,142, on which a profit is anticipated amounting to \$1,729,038. The costs are figured on the same basis as for the previous year, namely, 30.69% of the gross value. The low-grade ore is to be concentrated under contract with the Northern Customs Concentrators, Ltd. This local concern will treat the ore now on the dumps as well as the silicious ore extracted in the regular course of mining. During the year 3269 ft. of driving was done in the La Rose mine, 410 of raising, 125 of shaft sinking, and 1684 of cross-cutting. The most important development on the other mines of the group consisted of shaft sinking, 72 ft. on the Princess, 91 on the University, and 34 on the Violet.

The output for the year was 6173 tons of ore, containing 3,005,363 oz. silver, yielding a net value of \$1,363,039. The operating expense was \$259,089, or \$42.73 per ton, equal to 8.89c. per ounce of silver recovered. Total cost of production was \$475,562, or \$78.43 per ton of ore, working out at 16.31c. per ounce of silver. The marketing expense consisted of smelter deduction on silver \$87,396, treatment

charges \$47,359, transportation \$61,525, analysis, smelter representatives, and insurance on ore \$9,977, making a total of \$206,258, or 13.60% of the gross value of the ore. The following table gives the tonnage of various sorts of ore produced and their corresponding silver contents:

| | tons. | Silver, oz. |
|-------------------------------|----------|----------------|
| Silver-cobalt-nickel ore..... | 1,671.82 | 2,264,896 |
| Low-grade silicious | 4,318.52 | 604,646 |
| Low-grade cobalt | 39.84 | 1,288 |
| Concentrate | 31.62 | 18,528 |
| Nuggets | 1.86 | 26,347 |

The company estimates its properties to represent an asset of \$7,463,595. Other assets bring up the total to \$7,995,487. Capital stock outstanding, at par value, equals \$7,535,644. There is on hand a surplus and undivided profit of \$421,481.

BUNKER HILL & SULLIVAN.

The report of the Bunker Hill & Sullivan Mining & Concentrating Co., just issued, shows a total income for the year ending May 31 last of \$3,453,691. Disbursements were: freight and treatment on ore, \$1,333,660; operating expenses, \$761,374; other expenditures, \$428,807; dividends, \$825,000. A balance remained in the hands of the treasurer of \$99,337. Ore reserves blocked out amount to 3,071,682 tons. During the year 344,470 tons were treated, but the new plant just completed will admit of local treatment of 40,000 tons per month, so that, including high-grade ore shipped direct to smelter, the future output will exceed 450,000 tons per annum. The mine is thus seen to be nearly seven years ahead of mill requirements. The assets, including book-cost of the several mines, are estimated at \$4,689,733. The contributions of the various mines to the ore production were: Sullivan mine, 56,155 tons, Bunker Hill, 270,985; Stewindler, 14,560. The total output of shipping ore was 3570 tons. The costs of stoping in cents per ton were as follows: foremen, bosses, blacksmiths, machinists, tool-packers, and others, 18.5; timbermen and carpenters, 8.2; miners, 34.3; carmen, 6.7; shovelers, 38.6; power-labor, 2.7; repair-labor, 2.6; explosives, 9.4; illuminants, 2.2; lubricants, 0.5; iron and steel, 0.8; miscellaneous supplies, 3.5; timber and lagging, 19.2; power supplies, 3; wood, 4.8; stable and stock, 0.5. This comes to a total of \$1.555 per ton. The total of all ore mined (344,470 tons) was produced at a cost of \$538,363. The concentrator treated 341,700 tons of ore, putting 5.05 tons into 1, at a cost of 38.6c. per ton. The distribution of this cost was: general labor, 4 cents; millmen, 13.6; laborers, 0.9; power-labor, 0.8; crusher-labor, 0.5; repair-labor, 1.3; illuminants, 0.4; lubricants, 0.5; iron and steel, 0.2; miscellaneous supplies, 7.4; lumber, 0.5; roll shells, 0.4; trommel screens, 0.5; crusher supplies, 0.9; power supplies, 4.3; and wood, 2.4. The summary of all costs per ton is as follows: stoping, \$1.563; tramming, 8.3c.; concentrating, 38.2; shipping, 4.7; superintendence and office expense, 8.; contingent expense, 4.1; ordinary legal expense, 0.8. Exploration amounted to 4,844 ft. of drifts, cross-cuts, raises, and winzes, costing \$44,152, or \$9.507 per foot. The average assay of the ore mined was 11.74% lead and 4.33 oz. silver per ton. This gave a gross value of \$3,972,337. The loss in mill-tailing amounted to 18.88% of the lead and 22.09% of the silver, making 19.44% of the combined market value of the lead and silver. The report submitted by Stanly B. Easton, the manager, contains a vast amount of minute detail, worthy the careful study of mine operators.

The company is at present confronting litigation brought by the Federal Mining & Smelting Co., claiming title through alleged apex-rights to portions of the Bunker Hill & Sullivan veins in depth. There is also a claim for damages for ore taken from the disputed ground. The Bunker Hill & Sullivan has expended large sums in investigations made by leading economic geologists in preparation for this legal contest. It is asserted that these studies have proved valuable to the company in the evidence adduced for an indefinitely long life for the mine, and that the light thrown upon the question of ore-genesis has been of the highest practical importance.

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

INJURY TO MINER—NEGLIGENCE IN STORING EXPLOSIVES.

The negligence of a mine owner in storing dynamite in dangerous quantities, where its accidental explosion would necessarily endanger the lives of the employees, was held to be the approximate cause of injury to a miner by the explosion of the dynamite, though the source of the spark exploding it was accidental and unknown.

Brown v. West Riverside Coal Co., (Iowa) 120 N. W. 732, Apr. '09.

DEED RESERVING MINERALS—EFFECT.

A deed conveying land, but reserving to the grantor all the clay, fire-clay, and other minerals, severs such minerals in ownership from the land, and creates two estates therein; and the grantee, the purchasers of the surface, can not obstruct the mineral owner from the use of the surface for ingress and egress and methods of transportation fairly useful and necessary.

Porter v. Mack Mfg. Co., (W. Va.) 64 S. E. 853, May '09.

MINER—ASSUMPTION OF RISK.

A miner assumes the risks incident to the service, and where the service involves the use of explosives, he takes on himself the risk of all injuries to which he may be exposed by their reasonable use; but he does not assume any risk created by the negligence of the owner of the mine, unless he knows and appreciates, or, as a reasonable person, ought to know and appreciate, the peril arising from the negligence, and chooses to remain in the service.

Brown v. West Riverside Coal Co., (Iowa) 120 N. W. 732, Apr. '09.

OIL AND GAS LEASE—CONSTRUCTION.

The discovery of oil or gas under a lease giving the right of exploration and production, in the absence of anything showing a contrary intention, is sufficient to create a vested estate in the lessee of the exclusive right to produce oil or gas; but the right may be lost by abandonment, by failure to produce oil or gas, or to pursue the work of production or development of the property. But the right will not be lost merely because the lessee continued to drill deeper in search of oil or gas in a lower sand, and oil or gas was not found in such lower sand within the limitation described by the lease.

Eastern Oil Co. v. Coulehan, (W. Va.) 64 S. E. 836, Apr. '09.

LOCATION OF MINE—DECLARATORY STATEMENT.

A declaratory statement describing the development work of a mine read as follows: "At the point of discovery a cut, the dimensions of which are 5 by 11 ft. and 5 ft. in depth, along the course of the vein has been run"; and in an amended declaratory statement it was stated that the locator within 30 days after posting his notice of location did distinctly mark said location upon the ground, so that its boundaries could be readily traced, and did dig a cut at the point of discovery of the following dimensions, to-wit: 5 ft. wide, 15 ft. long, and 10 ft. deep at the face of the cut." And the notice contained another statement as follows: "At the point of discovery said locator and claimant has dug a cut the dimensions of which are 5 by 15 ft. and 10 ft. in depth, in which is disclosed a well defined vein, crevice or deposit of ore at a vertical depth of at least 10 ft. below the lowest point of the rim or collar of said discovered cut at the face of said cut at the surface." Both the original and amended declaratory statements were filed within the required time after the notice of location was posted. While these declaratory statements did not comply technically with the requirements of the statute, the court said there was in them at least a substantial compliance, and that this was all that has ever been required.

Butte Northern Copper Co. v. Radmilovich (Mont.) 101 Pac. 1078, May, '09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

STATISTICS OF THE CLAY-WORKING INDUSTRIES IN THE UNITED STATES IN 1908. By Jefferson Middleton. Advance chapter, Mineral Resources of the United States. U. S. Geol. Surv., Pp. 52. Washington, 1909.

FACTS ABOUT THE COEUR D'ALENES. Coeur d'Alene Mine Makers' Association. Pp. 31. Wallace, Idaho.

A general description of the mines of a district that has a record of \$36,501,000 paid in dividends.

IRRIGATION ENGINEERING. By Herbert M. Wilson. 6th ed., revised and enlarged. 8vo., pp. 625, ill., index. John Wiley & Sons, New York, 1909. Price \$4.

Works on irrigation engineering are in great demand, and Mr. Wilson's is one of the most popular on the subject. His descriptions of methods are clear and concise, and the illustrations are copious and helpful. The work is designed for the layman, as well as being useful to the engineer. It is not mathematical, only a few of the problems arising being treated in detail. It is essentially an outline of methods, useful in planning and executing irrigation problems. Descriptions of many important dams, including the Roosevelt dam in Arizona, are given.

SUGGESTED RULES FOR RECOVERING COAL MINES AFTER EXPLOSIONS AND FIRES. By W. E. Garforth. 5 by 7, pp. 71., ill., maps. D. Van Nostrand Co., New York, 1909. Price \$1.50.

This is an exceptionally useful book. It covers an otherwise neglected field, is written by a competent authority, in simple, direct style, and is suggestive rather than dogmatic in tone. It is especially valuable in that much attention is devoted to precautions to be taken before an accident, and if these be followed there is no question that many small accidents may be prevented from becoming large ones. The book is up to date and takes full account of the changes in method of attack made necessary by the introduction of the oxygen helmet. It is bound in flexible covers and is suitable for being carried in the pocket.

LO ZINCO. By Roberto Muso-Boy. 4 by 6. 219 pp., 10 fig., 4 pl. Milano, 1909. Published by Ulrico Holpli. Price \$1.

This is an excellent little hand-book treating of the character and properties of zinc, its mineralogy, metallurgy, production, and uses, with chapters on sheet zinc, zinc alloys, zinc white, and lithophone. The author sticks to essentials and to principles. His account of treatment is not up to American practice and his knowledge of American deposits is naturally quite limited. For general principles, however, and to those who wish some account of the important Italian zinc deposits, the book can be recommended. A list, with addresses, of Italian zinc producers is included.

CONCRETE PLAIN AND REINFORCED. By Frederick W. Taylor and Sanford E. Thompson. 2d. ed., 8vo., pp. 847, ill., plates, diagrams, index. John Wiley & Sons, New York, 1909. Price \$5.

This work has been substantially enlarged in order to keep it abreast with the advance made in modern construction, where concrete is playing a part of ever increasing importance. The chapter on 'Reinforced Concrete Design' has been increased from 51 to 131 pages, and similar copious additions have been made throughout. The statement of results obtained by recent study of failure of concrete beams under diagonal tension will be found particularly interesting. In fact, this volume contains a most useful discussion of the entire subject of concrete beams. The first chapter is entirely new. It deals with the essentials of concrete construction, such as testing materials, proportioning the mixed aggregate, proper strengths for cement and concrete, water-tightness, effect of sea-water, and the like. The present edition brings the total issue in four years up to 11,000 copies.

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TABLE OF CONTENTS.

| | |
|---|-------------------------|
| EDITORIAL: | Page. |
| Notes | 675 |
| Encouragement to Shipping..... | 676 |
| Bullion-Tax Law in Nevada..... | 677 |
| ARTICLES: | |
| Pumping and Shipping Oil in Eastern Illinois..... | |
|R. S. Blatchley | 678 |
| Explosives in the United States During the Last Three Years..... | Charles E. Munroe 681 |
| Geological and Physical Conditions of Tonopah Mines..... | Walter P. Jenney 685 |
| Rye Valley Gold Mines, Oregon..... | Auguste Mathez 687 |
| Carburetors for Gas-Engines at Mines..... | E. N. Percy 687 |
| Débris Control in the Sacramento Valley..... | |
|A. D. Foote | 688 |
| Gold, Silver, and Platinum in California in 1908.... | 705 |
| Tungsten | 705 |
| Elmore Process on Tin Concentrate..... | 706 |
| DISCUSSION: | |
| Modern Quicksilver Reduction..... | H. W. Turner 690 |
| Ship Subsidies..... | Francis G. Newlands 690 |
| Slime Concentration..... | Frank R. Porter 690 |
| Researches Upon Cripple Creek Telluride Ore..... | |
|Henry B. Haigh | 691 |
| CONCENTRATES | 692 |
| SPECIAL CORRESPONDENCE | 693 |
| GENERAL MINING NEWS..... | 699 |
| DECISIONS RELATING TO MINING..... | 705 |
| DEPARTMENTS: | |
| Personal | 704 |
| Obituary | 704 |
| Market Reports | 704 |
| Publications Received | 706 |
| Catalogues Received | 706 |
| Commercial Paragraphs | 706 |

EDITORIAL.

CONSERVATION work in Hawaii has taken practical form. A special tax has been provided that yields over \$300,000 per year. The larger part of this is being used to promote emigration to the islands of men of the white races with a view to increasing the number of smaller holdings of lands. Topographic maps and stream gauging are being undertaken preparatory to water storage and land reclamation.

EDITAROD, in Alaska, is to be accessible by a new route if present plans carry. The Alaska Northern railroad, the old Alaska Central, is maintaining train service from Seward to Mile 72 from which point it is 400 miles to the new camp. Trails for part of the distance are already available, but appeals have been made to the Alaska Road Commission for a hundred miles of new winter trail, to complete the route. If reports continue favorable the service by this line may be maintained all winter. Stocks of provisions were taken in from Nome and Fairbanks before the close of navigation so that there is not likely to be suffering despite the rush.

THE Geological Society of America will hold its Twenty-Second Annual Meeting at Cambridge and Boston, Massachusetts, December 28 to 30. The Society is evidently enjoying well deserved prosperity. There are twenty-four candidates for Fellowship—a group of brilliant young men, all of whom have made valued contributions to science. It is in the stimulation of such workers that the Society is most useful. Honoring men who have served with distinction is a scarcely less important function. In electing as correspondents Messrs. Charles Barrois, W. C. Brögger, Archibald Geikie, Albrecht Heim, Emanuel Kayser, Edward Suess, and Ferdinand Zirkel, the Society is honoring itself as well as the men selected.

GOLD was produced in the Philippine Islands to the amount of \$78,000 in 1907, \$200,000 in 1908, and to a much larger sum in 1909. Dredging in particular is proving profitable. The dredges in operation are of the New Zealand type and are small. According to the report of the Bureau of Mines, one of them in the Paracale district last year handled 50,244 cubic yards, from which 2814 ounces of gold, worth \$50,653, was recovered. The period of work extended from May 25 to December 31. The placers are shallow and the bedrock a soft decomposed schist. The material is fine, 80 per cent passing through the screens. The black sand is valuable and is being saved for future concentration. This year two more dredges were built in this district. In the Benguet and Masbate districts

quartz mining is attracting attention and the operators are obtaining substantial results. The Mining Bureau is making an effort to attract the attention of American capitalists and miners. Coal of good quality is now available, the labor problem is proving relatively simple, and in general the mining laws are satisfactory. The field would appear to be well worthy of investigation.

TO ALLOW lorries on which the banksmen stand passing over the pit top four balks are often placed across the mouth carrying bridge rails on which the lorry and the bogie into which the kibble empties may be run. No, this is not a code message, neither has it anything to do with the 'Quantitative Classification of Igneous Rocks'. It is not even from Hashimuro Togo, but is English as it is written and printed in England, being an extract from a recently issued text-book on shaft sinking. The book is written by a well educated, thoroughly competent engineer, and excellently printed. The extract will perhaps explain sufficiently why it can never be of more than local use. Americans have no desire to claim a prescriptive right to the English language, but in all fairness we protest against English of the English, if this be a sample, being used in text-books.

PRAISE for the Mexican banking system has often been given in these columns; we believed that it deserved the commendation it had so widely received; but there is a weak point in every structure. There is a weakness in the Mexican banking law which needs the attention of the legislative body of the Republic. The Compañia de Hornos Partridge, S. A., is being re-organized with a capital of \$1,000,000 as the Banco Refaccionario de Fundiciones de Minerales, under the law providing for mortgage banks. These correspond in some respect to what are known in this country as State banks, to which are usually accorded the right of advancing money on real estate. This privilege is seldom exercised by the stronger State banks, which prefer to do business along safer lines, with funds readily available from commercial paper on short-time loans. But the debasement of banking to the level of a selling agent for special manufactures has never been sanctioned, tacitly or otherwise, in the United States, whatever other defects may have been permitted. In most States such practices are constituted misdemeanors, or felonies. The Banco Refaccionario de Fundiciones de Minerales, proposes, in the words of Mr. J. J. Mendez, its president, "to push our smelting system in those mines which have sufficient tonnage for treatment, but which have not capital enough to proceed with development." We know nothing of the merits of the Partridge smelting system; but we do know that there is something wrong with the Mexican banking law if it can be used to promote a special industry, diverting the capital of a bank and the money of its depositors, to subserve such an end. If this can be done by one concern, it must be so utilized by others, and the expectation of Minister José Yves Limantour to create general confidence in the credit system, which is vital to the industrial expansion of the country, must shortly experience a rude shock.

Encouragement to Shipping.

A certain humor lies in the fact that advocates of a Government-fostered merchant marine shy at the very shadow of the term 'subsidy'. Subsidy means 'lying in wait', and was applied to reserve forces in the Roman army, waiting ready to render aid in time of battle-stress. The public, however, all unconscious of etymologic bearings, has acquired the conception of somebody lying in wait when a subsidy is proposed, and it is difficult to eradicate the impression of things sinister from the word. Therefore, since it is to cast reproach if we use the word subsidy, let us speak in seriousness of the need to do something by way of encouragement to American shipping.

It was our privilege some time ago to point out the value of a large merchant fleet in attracting metallic products to our shores, and the consequent stimulus this would give to smelting. America is now the greatest producer of copper and lead in the world, which metals constitute the basis of the bulk of the smelting industry. Whereas in the early days the metallic output of this country was nearly nil, it is well to remember that the Baltimore clipper service carrying Yankee notions to Chile resulted in bringing back regulus, mattes, and copper bottoms, which were refined on the Patapsco. Thus was built up a copper business at Baltimore which all the subsequent changes in place and amount of production have been unable to destroy. The Baltimore refinery draws copper today from Montana, Utah, Colorado, and Arizona. A great shipping would give rise to many seaboard refineries, and render control of the smelting industry by a monopoly even more difficult than it is today. The exports of metal from South America are growing rapidly, and the United States should be prepared to draw them to her ports. The opinions expressed in our columns were voiced as a resolution by the American Mining Congress at Goldfield in September. To this Mr. Francis G. Newlands replies in another column, following the line of argument laid down in his speeches elsewhere, condemning the principle of a direct subvention, but urging the construction of vessels by the Government to serve in time of war as transports and colliers, and in times of peace as merchant vessels, operated under lease to private parties. This suggestion bears a family resemblance to the plan carried out in some other countries where loans are made by the government to private ship-owners, the ostensible object or excusing warrant being the provision of available carriers for national use. The suggestion is interesting; as a supplement to other measures it might be worth trying; but it seems utterly inadequate as a means for sending the American flag (as we love to say) proudly flying into all the ports of the world. The Merchant Marine League of California, which was organized the other day, with Mr. Frank B. Anderson as president, is making an earnest propaganda in favor of the Humphrey bill (H. R. 2694), calling for a mail subsidy of \$4 per mile on outward voyages of 4000 miles for vessels of 16-knot speed, on routes to South America, the Philippines, Japan, China, and Australia. This would be merely a sop; its importance would be mainly in establishing a precedent for a really effective law to stimulate

shipping under the American flag. As such it is worth working for. Certain it is no hope exists for an American shipping while our present tariff schedule remains in force, unless the ship-owners receive protection as well as the manufacturers. As a guarantee for adequate return to the public for such out-go, Mr. Champ Clark might propose his support and that of his followers in exchange for a bill preventing railroad discrimination in aid of any particular ocean carriers. When all steamship companies may automatically enjoy the advantages accorded the ones most favored by the railroads, abuse of ship subsidies is not to be feared.

Bullion-Tax Law in Nevada.

The poor man pays his taxes and grumbles; the rich man usually dodges all the taxes he can and protests. The more conservative and permanent an industry, the more readily does it submit to the tax assessor; the more speculative the business, the less is it willing to divide with the State which gives it protection. When Nevada was poor and its population small, the miners could have repealed the so-called bullion-tax law, but they accepted it as one of the inevitable conditions of life, along with poverty and hopes deferred. In fact, there was so little metal of any kind produced that few Nevadans were really conscious of the existence of such a law; they seldom came within range of its operation. Now that Nevada is rich and prospering, with mammoth copper mines at Ely, with gold and silver mines producing at Goldfield, Tonopah, and Silver Peak, and with the Comstock showing signs of revival, the mineral-tax law becomes a matter of great importance. When the mining law of 1866 was introduced in the Senate by John Sherman, he contemplated not only the disposal of the mineral lands, but permanent revenue to the Government from the minerals in the form of royalty. It was as a fiscal measure that the bill was drawn. The profound change from a law for revenue to one for encouragement of mining by granting title to mineral-bearing claims was effected by William M. Stewart, of Nevada, and yet the State he represented presently applied to its own benefit the principle advocated by Mr. Sherman. The law is an old one, and hence will not readily be erased from the statute books. The questions of the moment relate to the application of the law, or, stated otherwise, to its legal evasion. The burden rests upon "ores, tailings, borax, soda, or mineral-bearing material." The tax is assessed upon the net proceeds, which are subject to the same rate of taxation, *ad valorem*, as other property. The actual cost of extracting the ore or mineral, cost of selling, or cost of reduction and sale of the refined product, may be deducted, to arrive at the net proceed. This seems simple, although questions of theory in accounting enter into what may constitute legitimate charges against the gross output. A battle is being fought around the principle of depreciation. The recognition of this charge is readily admitted in the case of a custom plant, but is contested when applied to a mine, whether or not it be equipped with reduction works. It is somewhat difficult to see justifica-

tion for such a distinction. Theoretically a custom works would be available for all who might choose to ship ore to it for reduction; its zone of attraction would presumably include a larger and more enduring source of ore supply than a single mine would normally afford. Consequently the charges for repairs and renewals should cover depreciation to so large an extent that the chief contingency against which a depreciation charge would provide would be that of a possible change in current practice or methods of reduction which would render the plant obsolete. This contingency is always important in metallurgical operations. The depreciation charge is necessary in consequence. It is merely insurance against extinction, or against the possible necessity for seeking additional capital.

In the case of a mine, if conservatively financed, the capital would be returned within the predicted life of the enterprise, together with suitable profits. When exhausted, liquidation and dissolution of the corporation would follow. The conception of a mining company as ephemeral has widely prevailed, but in many parts of the world today such corporations are taking measures to prolong their existence by purchasing and operating new properties. There is no reason why this should not be as legitimate an aim for a mining company as for manufacturing concerns which fall under the classification of 'industrials'. A manufacturing company usually does not depend upon a single source of raw material. It draws from the cheapest source, and its relations to supply and market are changing. In order to prepare against eventualities, a depreciation or amortization charge is made, which is deducted from gross profit before distribution of dividends. We fail to see why such provision for the future is not as commendable in the case of mines as in that of manufactures. Tax assessors in Nevada do not see it so, and the law makes no specific mention of depreciation as a legitimate deduction from the net value of the output of a mine, but warrant is found for admitting its validity in the case of a reduction works. The two seem so analogous that it would appear warrantable to revise the statute in order to spare the world the unpleasant spectacle of corporations evading one law by taking shelter under another. What is permissible under certain statutes can not be wrong because not sanctioned under a specific statute. There is a fine sense of regard for the law, as interpreted by the officials, in the act of the Nevada Consolidated, which controls its reduction plant under a corporation separate from that which owns the mines. It writes off nothing for depreciation on plant, but charges the actual cost of treatment against the ore in the returns made to the tax assessor. On the other hand, the Goldfield Consolidated has made over its railroad and mills to a subsidiary corporation known as the Goldfield Consolidated Milling & Transportation Company, in order to avoid an excessive bullion-tax. Stock of the new company is owned absolutely by the Goldfield Consolidated Mines Company. It is an evasion, pure and simple, but frankly done, and should serve the purpose of awakening the Nevada legislature to the necessity for enacting a remedial measure.

PUMPING AND SHIPPING OIL IN EASTERN ILLINOIS.

Written for the MINING AND SCIENTIFIC PRESS
By R. S. BLATCHLEY.

After a well has been shot it is cleaned and tubing is put in to the bottom. The tubing is 2 in. diam. and costs $11\frac{1}{2}c.$ per foot. Inside of the tubing is put a 5.8-in. sucker rod extending to the bottom of the well. If the well is the initial one, the rod is attached direct to the walking beam of the drilling engine and is set to pumping. The well is connected to a nearby tank where the oil is caught or it is sent to the gen-



Producers Tank.

eral lease tanks. The tanks are cylindrical, being built of wooden staves, and are generally gauged to hold 250 bbl. Some range up to 1600 bbl. capacity. In the 250-bbl. tanks, each inch in depth equals $2\frac{1}{2}$ bbl. of oil and 'ten inches of oil', to use the terms of the oil man, equals 25 bbl. The cost of 250-bbl. tanks is about \$95. Second-hand tanks cost almost the same, and are more in demand, as it is considered that they are better, having already absorbed their quota of oil. Where there are a number of tanks on a lease a shed is built over them to protect the oil from evaporation by the sun. The tank-houses cost about \$60.

If a number of wells are drilled, a power-house is placed as near as possible to the centre of the lease. A gas-engine is installed usually on a concrete foundation. From the power, the wells are pumped by means of steel pull-rods or wire ropes provided with suitable angle-knees to change the direction of the pull. The rods are attached to an oscillating pull-wheel and are thus given a horizontal movement. At each well there is erected a 'jack' and a balance weight, to which the necessary sucker rods, which ply up and down inside the tubing, are attached. The weight of the sucker rod pulls the surface rods one way, while the pull-wheel pulls them the other way, thus giving the necessary balance of work. The surface rods are placed as nearly as possible on a level line and are guided by being set in notches cut in the top of short posts or props. The friction of the rod and the post is eliminated by keeping the con-

tact greased occasionally with common axle grease. One power will, at full duty, pump as high as 40 wells, but it is thought best not to put more than 25 or 30 on one power. The power man in charge can not look after any more than this and do his work well. To make the rounds of the wells twice a day will occupy most of his time. To this must be added looking after the engine and tanks, and making reports. The fuel used for pumping is gas, and is generally piped from the wells on the lease. There is occasionally a lease without gas, and in that case it is bought from some other lease or from a pipe-line.

The oil is pumped from the wells into the lease tanks and the salt-water present finds its way to the bottom of the tank, where it is drawn off by siphon or by plug. In pumping, the oil often roiles and a sediment arises which can not be piped with the oil. This is piped away from the bottom of the tank to a pit some distance from the power. The waste is burned and not allowed to run into the streams. In fact, a recent investigation by Federal authorities has put a stop to running waste oil into streams, it having killed many fish in the Wabash river.

After a tank has been filled it is customary to run steam through the oil to settle the sediment and impurities. This is done by running steam-pipes to the bottom of the tank. About three hours is necessary to steam a tank of 250-bbl. capacity. After this is done the oil is ready for the market. The power man notifies the Ohio Oil Co.'s gauger, who visits the lease on his rounds and measures the oil. A report



Stoy Station of Ohio Oil Company.

is made up and is signed by the gauger and the power man. In the report the amount of the oil is given and the method of conveying it—whether or not it is pumped or sent down a gravity line. In all reports 3% of the oil as gauged is deducted to allow for leakage, sediment, and evaporation. During the last two years the Ohio Oil Co. has built an extensive system of gravity gathering lines eliminating the cost of pumping oil from each lease. They have taken advantage of the slope along the streams and have placed pipe-lines along them, with branch lines to each lease. The oil flows down the line to a central sub-station, where it is caught and pumped back

through a large main to the pumping stations proper, situated at Bridgeport, Stoy, and Martinsville. From the latter point it is pumped through one 12-in. and two 8-in. pipe-lines across Indiana and Ohio to Eastern refineries, and one 8-in. line to Alton, on the Mississippi river. It is estimated that the discharge of oil from the lease tanks by gravity is twice as fast as through the use of the donkey pumps. A pump was previously requisite on each lease. It cost about 1c. per barrel to pump it in this fashion, whereas by the use of gravity it costs about 1/3c. In all cases the Ohio Oil Co. pays for the transfer. A regular force of men, aside from the company's corps of surveyors, is kept at work the year around, improving and repairing the lines. Today practically every lease in the field is provided with its branch gravity line, which runs to the nearest creek, while the company is keeping pace with new development, by laying new lines.

The development of the field and the production of oil has so increased beyond the ability of the Ohio Oil Co. to take the supply that a system of storage tanks has been established in conjunction with the

company's storage tanks. Accurate record is kept of the oil in these tanks by the auditing department, and when the oil is ready to be run eastward it is turned over to the discharge department. This division merely regulates and checks the pumping of the oil into and through the interstate lines.

In case the tank is struck by lightning and set afire, the company saves as much of the product as possible, about one-half usually, and the operator is not held responsible for any loss. It has been stated before that in gauging 3% of the oil was deducted for evaporation, and the like. The evaporation takes place during the storage of the oil in the steel tanks and in the transportation. Loss also occurs through sedimentation. The volatile portions of the oil are continually escaping. The Ohio Oil Co. is not a common carrier of oil, but is a buyer. The old system of merely carrying the oil and charging a certain sum for storage have nearly disappeared. The auditing department of the oil company is one of the most complete systems of its kind in existence, and the daily work it takes care of, as well as the keeping up of weekly and monthly reports, is enormous. The



Loading Rack for Oil.

discharge of gravity lines. Permanent tank-farms are maintained at Martinsville, Stoy, and Bridgeport. To these points, the central sub-stations discharge the oil for storage until it can be pumped eastward. Up to September 1, 1909, the Ohio Oil Co. had 480 of these tanks, each one having a capacity of 37,500 bbl. The cost of each tank, including the making of a circular dike to catch the oil in case of the bursting of the tank or of a fire, is \$9000. The tanks are made of riveted iron plate 1/2 in. thick at the bottom and 3/16 in. at the top. They are 95 ft. diam. and 28 ft. 7 1/2 in. high. The actual floor space is 7200 sq. ft. Some of the larger companies operating in the field have also established tanks for their own storage.

Each oil operator has his oil gauged and run. A 'run ticket' is made out and signed and the record is sent in to the Ohio Oil Co.'s books. In the course of one or two days checks are made out individually to the operators and to the farm owner, on the basis of a 'division order' signed and placed on file by all parties to each lease. The gauger is the agent standing between the people and the pipe-line company. He is paid good wages and is chosen for honesty and impartial work. After the oil is let into the gravity line it is considered bought. It is sent down the line to the sub-station, and in turn is sent to one of the

system is so complete that complaints hardly ever arise from the operators or from the land owners. The Ohio Oil Co. is taking about 60% of the production at the present time, or about 80,000 bbl. per day. Of this amount they are pumping about 71,000 bbl. eastward. They have at one time pumped the full capacity of 102,000 bbl. per day, but this rate could not be maintained. At the present time practically all the lease and storage tanks are kept full, and drilling and new development is discouraged. The average price per barrel in 1906 was 74c. In 1907 it dropped to 67.7c., and in 1908 to 67.2c. This last summer brought another drop

of price and a grading of the oil. In the spring, the price was 65c. for oil above, and 57c. below 30°. Later in the summer it declined to 60 and 52c. The latter prices prevail at the present time. Illinois ranks third in the production of petroleum, Oklahoma and California being first and second. The following table gives the monthly runs of oil from the years 1905 to 1908, as compiled by the Illinois and Federal Surveys:

| PRODUCTION OF OIL FROM 1905 TO 1908. | | | | |
|--------------------------------------|---------------|---------------|---------------|---------------|
| Month. | 1905, bbl. | 1906, bbl. | 1907, bbl. | 1908, bbl. |
| January | 55,680 | 781,812 | 2,640,065 | |
| February | 65,209 | 956,399 | 2,607,620 | |
| March | 19,352 | 1,547,232 | 2,734,617 | |
| April | 102,862 | 1,874,465 | 3,232,123 | |
| May | 267,746 | 1,138,918 | 3,227,522 | |
| June | 5,489 | 410,654 | 1,879,362 | 3,108,492 |
| July | 9,208 | 610,401 | 2,422,192 | 2,722,683 |
| August | 15,092 | 778,463 | 5,446,042 | 2,833,637 |
| September ... | 19,591 | 722,168 | 2,605,663 | 2,698,577 |
| October | 26,443 | 463,819 | 2,863,812 | 2,725,267 |
| November ... | 34,766 | 350,985 | 2,510,146 | 2,499,092 |
| December | 45,913 | 549,711 | 2,255,839 | 2,655,411 |
| Total | 156,205 | 4,397,050 | 24,281,973 | 33,685,106 |

The grand total of oil produced up to January 1, 1909, was 62,520,631 bbl. This did not include the

oil stored at that time, but gives the actual runs. It does include, however, the oil shipped by tank lines to minor refineries near the oilfield. Loading racks are kept up for tank-lines at Bridgeport on the Baltimore & Ohio railroad; Lawrenceville, Flat Rock, and Robinson, on the Big Four railroad; Bakers Lane, Oblong, Stoy, and Robinson, on the Indianapolis Southern railroad; Casey and Martinsville, on the Vandalia railroad; and Casey and Westfield, on the Cincinnati, Hamilton & Dayton railroad. Annual tank shipment amount to about one and one-half million barrels.

The average cost of the first well for the different pools and to the various sands in 1909 is as follows:

| COST OF INITIAL WELL. | | | | | | |
|--|------------------|---------------------|---------------------|-------------------|-------------------|----------------|
| | Clark county. | Crawford county. | Bridgeport Sand. | Buchanan Sand. | Kirkwood Sand. | Tracy Sand. |
| Rig | \$500 | \$500 | \$500 | \$500 | \$500 | \$500 |
| Drilling | \$360 | 800 | 875 | 1750 | 2200 | 2600 |
| Drive-pipe | 80 | 90 | 90 | 800 | 550 | 1200 |
| Casing | 250 | 650 | 700 | 1440 | 1550 | 2000 |
| Shooting | 90 | 90 | 90 | 100 | 100 | 100 |
| Tubing and pumping out- fit | 150 | 150 | 150 | 200 | 215 | 250 |
| Power and power-house with boiler | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 |
| Two tanks and tank- house | 250 | 250 | 250 | 250 | 250 | 250 |
| Belting and lead-lines... | 100 | 100 | 100 | 100 | 100 | 100 |
| Incidentals | 100 | 100 | 100 | 100 | 100 | 100 |
| Totals | \$2580 | \$3930 | \$4055 | \$6440 | \$7765 | \$8300 |

Following are the average depths of the various sands:

| Sands. | Feet. |
|------------------|--------------|
| Shallow | 400 to 500 |
| Robinson | 800 to 950 |
| Bridgeport | 950 to 1000 |
| Buchanan | 1320 to 1360 |
| Kirkwood | 1400 to 1550 |
| Tracy | 1750 to 1800 |

The average amounts of drive-pipe, casing, tubing, and rodding are given below for the different sands:

| Sands. | Drive-pipe. | | | Casing. | | | Tubing. | Rodding. |
|------------------|-------------|------------|--------|-----------|-----------|------------|---------|----------|
| | 13 in. | 12 1/2 in. | 10 in. | 8 1/4 in. | 6 1/4 in. | 5 1/16 in. | | |
| Shallow | .. | .. | 90 | 1130 | 1450 | 1700 | 440 | 440 |
| Robinson | .. | .. | 90 | 150 | 300 | .. | 890 | 890 |
| Bridgeport | .. | .. | 100 | 400 | 900 | .. | 940 | 940 |
| Buchanan | .. | .. | 820 | 400 | 950 | .. | 1340 | 1330 |
| Kirkwood | 40 | .. | 450 | 1300 | 1350 | .. | 1450 | 1450 |
| Tracy | .. | 350 | 720 | 1100 | 1460 | .. | 1760 | 1760 |

The cost of casing is as follows: 10-in., \$1.05 per foot; 8 1/4-in., 70c.; 6 1/4-in., 39c., tubing, 11 1/2c.; rodding, 4 1/4c. The incidentals, given in the above table include the cost of teaming, which averages \$4.50 per day in Clark and Lawrence counties and \$5 per day in Crawford county, and the expenses of the operator, such as livery, etc. The second and succeeding wells on a lease cost about \$1500 less in the Shallow fields, \$1850 in the Crawford county pools, \$1900 for the Bridgeport sand, \$2600 for the Buchanan sand, \$2600 for the Kirkwood sand, and \$3000 less for the Tracy sand, as the rigs, drive-pipe, a part of the casing, tanks, power, and power-house can be used repeatedly. There is, of course, an expenditure for tanks, engine fittings, and supplies, in addition to the above items. The cost of lead-lines and sur-

face-rods on a lease will increase proportionately with the number of producing wells.

The cost of operating a lease after it has become productive averages about \$136 per month. Of this, \$66 is for the salary of the pumper, \$40 for fuel, and \$30 for teaming and supplies. The supplies include cups, packing, tools, etc. This estimate applies to a lease of 10 wells. However, 15 to 20 wells can be operated almost as cheaply as 10. Generally if there are more than 12 wells a helper will have to be employed. He is termed the 'roust-a-bout'. It is found to pay to pump three or four wells on a lease, even if the yield is only 5 bbl. each per day. This is considered the lowest payable yield in the field. The output from four 5-bbl. wells per month, after deducting the royalty of one-sixth, is 500 barrels.

At the current price of 62c. per bbl. the following table can be made:

| | |
|---------------------------|-------|
| Income per month— | |
| 500 bbl. at 62c..... | \$310 |
| Salary of the pumper..... | \$66 |
| Cost of the fuel..... | 40 |
| Cost of supplies..... | 30 |
| | 136 |
| Net income | \$174 |

The opening of the Illinois field brought an influx of men eager to invest, who found that the field was already leased and taken. They discovered that the only way to become interested was to organize a company and buy properties that had already been found to be productive. Sometimes they attempted to buy up what stock was in the market. This was usually found to be scarce and many investors found hardly any opening. It is true that the oil faker has not set foot to any extent, if at all, in the main oilfield, as it is too thoroughly studied and known. The operators are closely allied, and it is thoroughly understood that dishonest men are not wanted. Nor can he find a chance to operate near the field, because of the vigilance of the men old in the business, who watch all new drilling. There has been some 'salting' of wells in the outlying territory in the State, but in every case the faker has been exposed.

It is common advice to every one that it is not safe to invest in any oil venture unless he is well acquainted with the promoters of a company and knows them to be honest and experienced oil operators. If it is desired to speculate, then it is proper to investigate personally. The oil business is a gamble itself, that is, risk is always present and chance is a big element in success. Careful study may, however, eliminate some of the chances of failure.

It is fortunate that the Federal Survey found opportunity to carry on topographic surveys in and about the Illinois fields. Work is being done at present in the Bridgeport quadrangle, and in 1908 the Hardinsville quadrangle was completed to the north of it. This gave an opportunity to the State Survey to run levels to about 5000 wells. By this means the dip of the sands is being definitely plotted and contour lines are being drawn. This is done by subtracting from the elevation above sea-level of each well that of the top of the oil-sand below. Relations to the anticlinal features present are being studied, and it is hoped that a report of value in finding oil properties will result.

EXPLOSIVES IN THE UNITED STATES DURING THE LAST THREE YEARS.

By CHARLES E. MUNROE.

*In my report on the progress of the explosives industry in the United States, made at Rome, I was obliged to give an estimate for the quantity of explosives manufactured in this country in 1904. Since the Congress at Rome was held, analysis of the data of the Census of Manufacturers of 1905, which practically covered the manufacturing operations of the calendar year 1904, has been completed, and a detailed account of the results, together with those obtained through a similar census in 1900, are presented in the accompanying table. These statistics show an increase in every item for 1905, as compared with 1900, the largest increase in value, \$4,652,970, being for dynamite and, except for 'all other explosives', the largest percentage of increase in value, 156.8%, is for smokeless powder. The largest increase in quantity, 86,062,500 lb., is shown for blasting powder, and the next largest, 45,074,373, for dynamite, but the greatest percentage of increase in quantity, 129.6%, is for smokeless powder. The quantities and cost of the principal materials used in the United States during the census year 1900 and 1905 are set forth in Table II.

The statistics of Table II also show an increase in every item, the largest increase in quantity, 53,002 short tons, being in mixed acids; the second largest, 44,510 short tons, being in nitrate of soda; and the third largest, 18,504 short tons, being in charcoal. The largest increase in any single item of cost, \$2,705,691, is for nitrate of soda; the second largest, \$1,307,663, for mixed acids; and the third largest, \$1,113,108, for glycerine. Pyrite appears among the materials used in this industry for the first time in the census of 1905, and it marks the introduction in the United States of contact-processes for the manufacture of sulphuric acid, a material which is extensively consumed in the manufacture of explosives. The marked increase in the quantity of nitrate of ammonia used, 3,202,058 lb., or 539.1%, indicates the marked increase in the quantity both of safety-explosives manufactured, and of weak nitric acid residues utilized. It is to be noted that in some instances sulphate of ammonia was employed in place of aqua ammonia, or ammonia liquor, mentioned in Table II. The increase in the quantity of ether used, 2,167,341 lb., most of which was consumed in the establishments in which it was produced, corresponds closely with the increases in the production of smokeless powder and particularly that portion of it which was used in the manufacture of military powders.

The quantity of explosives reported as produced for sale in the census year 1905 was 363,748,097 lb. The estimate given for that year in my report at Rome was 346,841,891 lb., but, as is frequently the case, the estimate was below the truth. Owing to the business depression beginning in 1907 it is not believed that the increase in the output of this in-

dustry for the period subsequent to 1904 has been at the rate shown for the 1900 to 1905 interval, yet this industry has suffered during the period of financial depression less than many other industries owing to the great quantities of explosives required by the United States Government in its large engineering projects at Panama, and in the development of irrigation in the arid regions of the Western States.

In my report at Rome I called attention to the fact that, owing to the geographical situation of our explosives factories with regard to the industries of this country in which their product was consumed, practically all of the product, except such liquid nitroglycerine as was used in removing obstructions in petroleum oil wells, was transported from the factories to the place of use by railroads, and an attempt was made to show the magnitude of this daily transportation, but, through some cause not understood, the figures, as published, were confused, and it may therefore seem proper, since the more reliable data are at hand in place of the estimates then available, to re-state this. In the United States a carload is generally fixed at 20,000 lb., hence, omitting the weight of the containers, the 363,748,097 lb. of explosive produced during the census year 1905 would provide 18,187 carload lots, or for 300 working days per year, there would be supplied 61 full carloads each day. But it is the opinion of railroad officials, based on their experience in transporting explosives, that through re-shipment from central depositories, and from magazines to consumers, the number of cars carrying small lots is five times as great as those carrying full loads, hence the total number of cars loaded with explosives during the year would be 109,122 or 364 per day for a work-year of 300 days. It is further estimated that the average time for transporting each of these cars from the place of loading to that of discharge is 10 days. There will therefore be on an average 3640 cars loaded with explosives on our railroads during each of the 300 days, or for the calendar year, of 365 days, there would be 2990 cars per day, but, as the demand is not constant, the number per day during the busy season would be greater, and near distributing points this traffic would be quite dense. As stated, this estimate is based on the returns for the census of 1905, and while no doubt the traffic has increased within the United States since 1905 at the rate which obtained between 1900 and 1905, first, because of the business depression which has arrested industrial development, and, second, because the factories situated near deep water have been able to ship the large quantities of explosives required on the Panama Canal work directly by water.

Following the consideration by the American Railway Association of methods for controlling the transportation of explosives, an organization was formed styled 'The Bureau for the Safe Transportation of Explosives and Other Dangerous Articles', with Charles B. Dudley as president, and B. W. Dunn chief inspector. This is a purely private organization of railroads formed to secure uniformity in regulations in the different States, it not having

*Read at the Seventh International Congress of Applied Chemistry, London.

been possible to secure this result by legislation. Two annual reports have now been issued by the chief inspector. From the one for the present year it appears that 158 different companies, representing published book of instructions contains an ingenious intersection table which shows at a glance the incompatibles which should not be loaded or stored together. Other pamphlets in which methods of

TABLE I.—QUANTITIES AND VALUES OF EXPLOSIVES PRODUCED IN THE UNITED STATES IN THE CENSUS YEARS 1900 AND 1905.*

| | 1900. | | 1905. | |
|--|-------------------------|-----------|-------------------------|-------------|
| | Quantity. | Value. | Quantity. | Value. |
| Gunpowder, lb..... | 5,450,773 | \$614,290 | 10,383,944 | \$1,541,483 |
| Blasting powder, kegs ¹ | 4,774,948 | 4,780,903 | 8,217,448 | 7,377,977 |
| Nitroglycerine, lb..... | 35,846,456 ² | 5,532,570 | 51,579,270 ³ | 7,730,175 |
| Dynamite, lb..... | 85,846,456 | 8,247,223 | 130,920,829 | 12,900,193 |
| Gun cotton, lb..... | 2,988,176 ⁴ | 1,478,619 | 5,905,958 ⁵ | 2,435,805 |
| Smokeless powder, lb..... | 3,053,126 | 1,716,101 | 7,009,720 | 4,406,477 |
| All other explosives..... | ..... | 6,493 | ..... | 190,948 |

1. A keg contains 25 lb. of blasting powder.
2. Including 31,661,806 lb., produced and consumed, valued at \$4,749,271.
3. Including 43,643,270 lb., produced and consumed, valued at \$6,110,058.
4. Including 2,139,834 lb., produced and consumed, valued at \$1,069,917.
5. Including 5,522,796 lb., produced and consumed, valued at \$2,209,118.

*'Chemicals and Allied Products', by Charles E. Munroe.

202,186 miles of railroad, are now members of the association and controlled by its regulations, while 22 inspectors and special agents are employed in enforcing its regulations. These regulations have been loading are set forth with much precision, or conveying specific information as to methods of inspection, labeling, and other requirements, have also been issued. A campaign of education has been

TABLE II.—QUANTITIES AND COSTS OF PRINCIPAL MATERIALS USED IN THE EXPLOSIVES INDUSTRY IN THE UNITED STATES IN THE CENSUS YEARS 1900 AND 1905.*

| | 1900. | | 1905. | |
|------------------------------|------------------------|-----------|------------------------|-----------|
| | Quantity. | Cost. | Quantity. | Cost. |
| Alcohol, grain, gal..... | 191,125 | \$99,166 | 850,560 | \$231,353 |
| Aqua ammonia, lb..... | 649,703 | 11,303 | 997,830 | 46,916 |
| Charcoal, bu..... | 928,344 ¹ | 114,172 | 2,408,667 ² | 446,078 |
| Cotton, lb..... | 1,771,221 | 103,971 | 4,515,787 | 443,998 |
| Ether, lb..... | 1,257,904 ³ | 88,053 | 3,425,245 ⁴ | 479,494 |
| Glycerine, lb..... | 16,983,918 | 2,016,557 | 24,561,527 | 3,129,665 |
| Mixed acids, tons..... | 39,596 ⁵ | 1,785,766 | 92,598 ⁶ | 3,093,429 |
| Nitrate of ammonia, lb..... | 593,975 ⁷ | 26,742 | 3,796,033 ⁸ | 948,307 |
| Nitrate of potash, tons..... | 3,315 ⁹ | 270,186 | 4,114 ¹⁰ | 308,644 |
| Nitrate of soda, tons..... | 88,524 | 2,902,866 | 133,034 | 5,608,557 |
| Nitric acid, tons..... | 7,528 ¹¹ | 601,494 | 20,406 ¹² | 1,646,543 |
| Pyrite, tons..... | ..... | ..... | 12,256 | 67,261 |
| Sulphur, tons..... | 12,742 | 317,383 | 19,574 | 507,469 |
| Sulphuric acid, tons..... | 40,385 ¹³ | 681,934 | 49,298 ¹⁴ | 774,361 |
| Wood, cords..... | 600 | 4,800 | 5,628 | 38,780 |

1. Includes 118,419 bushels, produced and consumed, valued at \$14,210.
2. Includes 1,156,918 bushels, produced and consumed, valued at \$214,030.
3. Includes 1,222,704 lb., produced and consumed, valued at \$85,589.
4. Includes 3,382,895 lb., produced and consumed, valued at \$473,605.
5. Includes 6000 tons, produced and consumed, valued at \$270,180.
6. Includes 37,669 tons, produced and consumed, valued at \$2,260,129.
7. Includes 483,975 lb., produced and consumed, valued at \$21,779.
8. Includes 2,863,857 lb., produced and consumed, valued at \$715,964.
9. Includes 1468 tons, produced and consumed, valued at \$119,642.
10. Includes 1778 tons, produced and consumed, valued at \$133,385.
11. Includes 7274 tons, produced and consumed, valued at \$583,125.
12. Includes 18,988 tons, produced and consumed, valued at \$1,510,040.
13. Includes 32,366 tons, produced and consumed, valued at \$548,222.
14. Includes 30,994 tons, produced and consumed, valued at \$526,898.

*'Chemicals and Allied Products', by Charles E. Munroe.

formulated and published by the American Railway Association and cover in detail the packing, reception, handling, stowage, and classification of the various explosive and inflammable substances. The entered upon and the president, chief inspector, and agents have repeatedly addressed bodies of railway men and business men, both managers and employees, in an endeavor to have the properties of

the bodies dealt with and the reasons for the regulations formulated, well understood, so that intelligent co-operation could be secured.

This movement to protect life and property has been facilitated by the Congress, which by Act of May 30, 1908, repealed all previous Acts relative to this subject except Section 4422 of the Revised Statutes of the United States, and it directed the Interstate Commerce Commission to formulate regulations for the safe transportation of explosives, which regulations should be binding upon all common carriers transporting explosives by land, and it fixed penalties for the violation of these regulations. The report of the hearings before the Committee on Interstate and Foreign Commerce through which this legislation was secured is given in House Report 7557 for 1908, and it shows that the officials of the Bureau were largely instrumental in securing this legislation, which brought the regulations of the Federal Government, which controlled between the States, and the Bureau, which operated also within the States, into harmony. An incidental, though important feature of this legislation, was the repeal of the Act of Congress of July 3, 1866, which forbade the transportation of nitroglycerine or similar substances, even when absorbed in a dope, unless they were "securely inclosed, deposited, or packed in a metallic vessel surrounded by plaster of paris, or other material that will be non-explosive when saturated with such oil or substance." This legislation followed shortly after the explosions at New York, Aspinwall, and San Francisco, and the serious accidents accompanying the introduction of nitroglycerine into Europe. It was conceived in fear, and framed in ignorance of the properties of the substances sought to be controlled. The result was vicious because it created a more dangerous set of conditions than obtain in ordinary practice, yet it remained on the statute books of the United States for nearly 42 years. It is safe to say that it never was obeyed, and that the millions of pounds of explosives transported in those years have been transported in violation of law. Singularly, it appears that its violation has never been made a cause of action in the courts until, subsequent to its repeal, it has been brought forward in an issue then on trial. Acting under its general powers to fix railroad rates for transportation, the Interstate Commerce Commission has also differentiated between explosive compounds, and after investigation has by order of April 13, 1908, fixed the rate for an ammonium nitrate composition at second class in carload lots with a minimum of 20,000 lb. and $1\frac{1}{2}$ times the first-class rate in less than carload lots. This was less than was asked for by the manufacturer, but it gives such an explosive great advantages over its competitors. It is the first instance of this kind, and marks radical departure.

Another departure from the governmental methods which have heretofore prevailed is found in the investigation of explosives for use in coal mines and of the causes of accidents in such mines by the United States Geological Survey. This investigation was begun at the George Washington University in 1907, the work there being largely confined to the develop-

ment of methods for the analysis of explosive substances and the test of these as they were found in use in various mines. One immediate result was the drawing up of specifications for explosives to be purchased for use at Panama and in the Reclamation Service, and this system of purchase, subject to chemical inspection, now obtains under the Federal Government. In 1908 a portion of the buildings and grounds of the United States Arsenal at Pittsburg, Pennsylvania, were obtained for the purposes of this research, and an experimental gallery was erected there, testing apparatus of various kinds was installed, a chemical laboratory equipped, and the Station opened for work in September 1908, the occasion being graced by the presence of a board of foreign experts, composed of men who had been engaged in similar studies in Europe. Since then the Station has been steadily employed in making firing trials of analyzed explosives, and in January 1909 the Director of the Survey announced that it was ready to make official tests for permissibility for use in mines containing gas alone, gas and dust, or dust in dangerous quantities, and he announced the test requirements which had been fixed for explosives for use in coal mining. It should be stated that the decisions arrived at can have no other force in law in the States than that of an expert opinion, but the Federal Government may make these decisions law in the Territories and the District of Columbia. It is, however, expected that the conclusions of this Bureau of the Government, and the conditions it fixes, may, through the force of public opinion, come to be accepted as authoritative throughout the different States of the Union.

Since the last meeting of this Congress one of the two smokeless powder factories then referred to as being under the direction of the Navy Department has been dismantled and abandoned, but the other has been greatly developed, while an additional one, of similar magnitude, has been created under the direction of the War Department. This movement has been promoted by the fact that the manufacture of military smokeless powder by private establishments in this country is today controlled by a single corporation, and it is regarded as a sound policy that the Federal Government should possess factories of such capacity, both in time of peace and in time of war, as to prevent a private monopoly from controlling the price of powder when an emergency, in which a considerable quantity is required, arises. A joint board of officers of the Army and Navy has been created for the purpose of determining the composition, methods of manufacture, and sizes of grain, which shall be adopted, so that the product may be interchangeable between the two services according to the calibres made use of. In all this the Navy has taken the initiative, as its factory and methods have been long established, while the Army has but recently become a producer. In common with many European countries the United States has adopted for its service-powder one made only of cellulose nitrate of low nitration, and in common with such other services it has suffered severely from flare-backs, due to the excessive production of carbon monoxide from the incompletely nitrated cellu-

lose, and also from progressive deterioration in storage, which is characteristic of these powders. To ensure stability, provision is made for re-working the powder every three years, and the process has been now so developed that this is done at a cost of but 11c. per pound. Nevertheless, a system of magazine refrigeration is urged on the ground that it will treble the life of the powder, and also better preserve its ballistic qualities.

Among the many new compositions for smokeless powders which have been brought forward, only one seems to have received serious consideration. This one, composed of cellulose nitrate and trinitroanisol, is known as stabilite, and is claimed to possess several advantageous qualities, not the least of which is that long continued drying for the removal of solvents, such as is essential in the manufacture of the cellulose nitrate and cellulose nitrate-glycerol nitrate powders, is unnecessary in making this. There is consequently effected in this feature of manufacture not only a saving of time, but of expense and interest, while the hazard of manufacture is also reduced. However, as it is understood that trinitroanisol may be hydrolyzed to picric acid and methyl alcohol, there is some question as to the permanency of the product, and its suitability for adoption as a service powder, even if its ballistic qualities should be found to be what is desired.

Some of the private arms and ammunition factories engaged in the manufacture of small arms and ammunition for military as well as sporting purposes have come to recognize the value of applied science in fixing the quality of their products. The application of mechanical tests to the metals used has been the practice for some time, but more recently the service of the chemist has been sought with most gratifying results. At the factory of the Winchester Repeating Arms Co., there is expended daily in the firing tests of the ammunition, and of the guns for accuracy and action, 27,000 metallic cartridges, 5200 shot shell cartridges, and 1700 primers. The priming mixtures in these latter are analyzed and tested on a drop-test machine. These tests are very rigid, and but a slight tolerance is allowed. The following is abstracted from a private communication: "In regard to the every day shop-routine tests of ammunition, every powder as it is received by us has its own ballistics determined and its load fixed according to the velocities and pressures which we desire our ammunition to have. Also we take hourly from each machine ammunition, which is in turn tested to see whether we are actually getting the ballistic results that we have ordered from the loading-room. Rifle cartridges are also tested for accuracy and penetration by skilled shooters, who also take notice of any small peculiarities which may show themselves, and the shot shell ammunition is tested for pattern. All powders received by us are unloaded and opened at our powder-receiving house, three miles from the factory, in a large enclosure in which we have our magazines for storage. These magazines are kept under careful observation as to temperature and moisture, and the various powders are tested from time to time for any chemical deterioration. All powders received, of

every description, are subjected to the standard Abel-tests, and the German or 135° test for stability, in addition to the standard stability-tests, and as our ammunition is shipped to all parts of the world, in making our choice as to the acceptability of the various powders, they are tested to see how they will withstand severe conditions of climate. The ammunition is subjected to temperatures from 60 to 150°F., and the effect of these temperatures for different times is noted. We carefully investigate as to the chemical composition, the kind and degree of nitration, and the gun cottons employed in making the powder; the solubilities of the gun cottons; and the hygroscopic properties of the powder. In investigating the ballistic properties of the powder our conclusions are all based on results obtained when the powders are bone-dry; and when they contain a certain given amount of moisture, which we have fixed as one which would be about the maximum the powder would tend to take up under severe conditions; and also after any deterring agent, such as vaseline, has been removed.

The records of the United States Patent Office show that the efforts of inventors during the last three years have been directed largely toward the perfecting of chlorate powders, and the stabilizing of nitro-starch, there having been issued to one inventor on January 7, 1908, 16 patents on the use of various chemical substances in rendering nitro-starch permanent. Nevertheless, neither of these types of explosives appear as yet to have made much progress in use. Among odd stabilizing agents which have been proposed for use are boric acid, borax, and arsenates. A novel chlorate mixture is one containing nitrated phthalic acid.

The advances on the manufacturing side of the explosives art in this country have been largely in the mechanical devices employed, through which the speed of production has been increased, and the cost of the product lessened. Among these may be mentioned improvements in nitrating-centrifugals, whereby the quantity of acid per unit of cotton has been decreased; improvements in hydraulic presses; in powder-cutting devices; in solvent-recovery apparatus; and in methods of reworking condemned powder. Hall has devised a successful plan by which to rebuild spent acids with oleum, for use in the manufacture of soluble cotton. G. F. Samuel has devised a very satisfactory magazine and thaw-house for dynamite, which is described, with scale drawings, in the *Engineering News* (page 692, June 25, '08). Accidents in thawing dynamite are due to the use of improper methods rather than to capriciousness in the explosive. Where no regulations prevail it is a common practice for contractors to put up a frame building covered with tar-paper, and having a steam coil in the bottom in which to thaw large quantities. Such buildings are exposed to fire from the outside, an overturned lamp inside, and overheating from the dynamite or the nitro-glycerol exuded from it coming in contact with the steam-coil. The style designed by the commission which investigated the explosion at the Park Avenue tunnel, New York, has never come into general use because, through defective circulation of air and lack of uniformity in heating, it failed

to thaw the dynamite. The author, in conjunction with officials of the Aetna Powder Co., built and tested an experimental thaw-house at Aetna, Indiana. The house is about 5 by 5 ft. inside, and is divided for convenience into two compartments for storing the material to be thawed, and a separate compartment for heating the air. The space to be used for the dynamite is so arranged as not to allow room for a man to enter, requiring the attendant to remain outside the building while handling the trays, thus avoiding danger of overturning a lamp in the building. The air is heated by passing over the steam coils, and a positive circulation is secured by a stack, which has an effective height of 15 ft. The quantity of air admitted to each compartment is regulated by dampers with circular holes in the bottom of the thaw-house, and the draft is regulated by a damper in the stack. The trays containing the dynamite to be thawed are staggered on their supports, presenting a series of baffles; these prevent the air from short-circuiting, and force it to come in contact with all the trays. The house is covered with galvanized iron to protect it against creeping fires in grass or underbrush. A $\frac{3}{16}$ -in. steel plate over the door, and gravel filling between the walls, form protection from stray bullets. Gravel is preferable to sand for filling, as the heat tends to shrink the wood on the inside, giving rise to cracks through which the sand escapes. Thermometers placed inside the house, but so arranged that they can be read from the outside, allow the attendant to keep the temperature under control. A temperature of 80°F. is considered desirable for thawing the dynamite. Good grades of gelatin dynamite may be thawed safely at higher temperatures, but with low grades of dynamite the nitro-glycerol is liable to separate if heated much above this temperature. The box containing the steam-coils is lined inside and outside with galvanized iron to protect it against fire. Where exhaust steam is used, about 70 sq. ft. of heating surface is required to raise the temperature from zero to 80°F. The capacity of the thaw-house is 540 lb. and it cost \$165.

As a contribution to the literature of accidents from the use or abuse of explosives, attention may be properly called to the sixth annual report on Fourth of July injuries which appeared in the *Journal of the American Medical Association*, September 5, 1908. The total number of killed was 163, and of injured 5460. The number of cases of tetanus from wounds was 76. The statistics are carefully analyzed, and measures to prevent this foolish waste are proposed.

Oregon consumes annually about 1,200,000 bbl. portland cement. Of this quantity about 270,000 bbl. is of domestic manufacture, two-thirds coming from California. Only one cement plant, that of the Washington Cement Co., at Concrete, exists in Oregon, which began operations in 1907. It has two 100-ft. rotary kilns, crude oil being used for firing. The limestone comes from quarries at Concrete, and the clay is derived from the banks of Baker river. The cement is rather high in silica, containing 24%, in this respect resembling the cement made at the Vulcanite works in Pennsylvania. It is below 2% in magnesia.

GEOLOGICAL AND PHYSICAL CONDITIONS OF TONOPAH MINES.

By WALTER P. JENNEY.

*A cluster of low volcanic peaks marks the site of the mining camp of Tonopah. It has in the past been an area of repeated eruptions of lava, beginning in the early Tertiary and continuing until comparatively recent geologic time. With the dying out of the eruptive phase of volcanic activity, there followed a period of intense dynamic action, accompanied by the formation of deposits of gold and silver ore. So recent has been the cessation of volcanic outbursts in this district that the rocks, like the eruptive formations of the Comstock, still retain a portion of their original heat. Notwithstanding the compara-



Montana-Tonopah Shaft.

tively late deposition of the ore, there are evidences in the mines that the formation of the deposits extended over a long period, with many disturbances and interruptions.

The order of eruption is the earlier andesite, the later andesite, and the rhyolite. The earlier andesite is white or light gray in color, soft, breaking with a rough fracture; the later andesite is darker, weathering near the surface with a deep brown or purple tint, so that it is usually readily distinguished from the earlier andesite; the rhyolite breaks with a fine-grained, splintery fracture, and is commonly light greenish-gray. The general dip of the andesites is to the north, at angles usually from 15 to 45°; the rhyolite sheet, being intrusive in the older lavas, often does not conform to this dip, and in some areas is nearly horizontal. The earlier andesite is the great

*Abstract from the *Tonopah Miner*.

ore-bearing formation of the district, and for this reason is called by the miners the 'lode-porphyry'; the rhyolite in places carries workable deposits of ore; while the later andesite, known as 'cap-rock', is usually barren. Owing to causes not necessary to discuss, the veins are larger and more regular where traversing the earlier andesite, and often contract in width, or pinch out altogether on entering the rhyolite. In some instances, however, the veins pass from the lode-porphyry into the rhyolite without material change in breadth or richness.

The favorable nature of the earlier andesite as a wall-rock is shown by the production; more than 90% of the ore extracted from the mines of Tonopah has been stoped from veins in that formation. In this the ore deposits conform to the general law of selective deposition, namely, that some geological formations appear to be everywhere barren of ore; others occasionally carry small deposits, workable where the conditions are exceptionally favorable; but in each mining region certain strata are ore-bearing in a degree exceeding all other formations combined.

The earlier andesite appears at the surface in a limited area, in ground owned by the Midway and by the Tonopah Mining Co., where it extends to a depth of 500 to 600 ft.; elsewhere it is capped by the dark-colored later andesite, or by flows of rhyolite. Beneath these capping formations the earlier andesite has a much greater areal extension and stretches east and west in a broad belt, extending from the Belmont mine, at the extreme east of the district, to the Tonopah Extension and Golden Anchor properties on the west, a distance of nearly a mile. In the Tonopah and Midway workings the belt is developed over a breadth of 1000 feet.

In prospecting the Tonopah mines the problem is largely the exploration of the lode-porphyry, or earlier andesite. Owing to the fact that all the ore deposits known in the district are subsequent in formation to the intrusion of the youngest rock in the series, the rhyolite, in following the veins in depth, certain places are found where conditions have been such that the ore departs from the earlier andesite and cuts through the underlying rhyolite. In the ascent of the solution toward the surface the veins usually terminate on reaching the cap-rock; from this cause many of the productive veins are 'blind' and do not appear at the surface. Only on the Tonopah and Midway properties, where the earlier andesite-flow covers the surface, do the veins outcrop with pay-ore. Other orebodies spring from the contact of the rhyolite with the earlier andesite (which forms the foot-wall or south boundary of the lode-porphyry belt), and extend upward in the andesite. In the West End and MacNamara mines, sheet deposits of high-grade ore occur on this contact. Some of the larger veins, when followed on the dip, go down in a series of flats and pitches (like a flight of giant steps), in which the horizontal travel of the vein to the north is greater than the vertical descent on the normal dip. This tends to carry the ore-bearing fissures toward the north side of the earlier andesite belt.

There is a peculiar early-formed fault-fissure, filled

with volcanic mud, which cuts through all the igneous flows and outcrops at the surface, from the Belmont mine west to beyond the Midway, known as the Mizpah dike, and while not ore-bearing, it has influenced the deposition of orebodies along its course. In the deeper levels of the mines there is evidence that the waters which formed the ore in some instances came up through channels alongside the dike.

The ore formation may be described as a broad belt of fissure veins, often closely spaced, traversing the district in a general east and west course. The extent of this mineral belt is undetermined; continuous stopes and connected levels reach from the Belmont mine, westerly through the Tonopah, Jim Butler, Montana, Midway, MacNamara, West End, and Tonopah Extension mines. With present development, ore deposits are opened along the course of the belt for nearly a mile, and are distributed over a breadth, north and south, of 3000 ft. The veins vary widely in width and often subdivide into branch veins, which not infrequently equal in size the original fissure. The great output of the camp is drawn from stopes averaging 4 to 5 ft. wide.

The ores are largely quartz, carrying silver glance (argentite), ruby silver (pyrargyrite), and the so-called 'brittle silver' (polybasite), together with chalcopyrite and other sulphides bearing gold and silver. The ratio of silver to gold in the ores is quite uniform throughout the district, being 90 to 100 oz. silver to 1 oz. gold; in the bullion produced, about one-third the value is gold. The grade of the ore as sent to the mills ranges in assay value from \$12 to \$50 per ton. The Tonopah ores resemble in mineral character and in the ratio of gold to silver those of the Comstock.

The Tonopah Merger Mining Co. owns the Salutation, Limerick, Limerick No. 2, Sky, Sky No. 2, and Sky No. 3, lode mining claims and fractions, and also the Golden Anchor property, embracing the Golden Anchor, Triplet, and Black Mascot patented claims. The Golden Anchor shaft is sunk to a depth of 855 ft., with levels at 400, 500, 740, and 840 ft. The shaft is equipped with machinery, air-compressor, and so forth, capable of exploring the ground to a depth of 1200 feet.

The shaft starts in the 'cap-rock', or later andesite, and continues in that formation to a depth of 550 ft., the 400 and 500-ft. levels being in later andesite. Below 550 ft. the shaft is in rhyolite to the bottom. An important development is made on the 840-ft. level, a cross-cut run north entering the lode-porphyry, or earlier andesite, at a point 290 ft. from the shaft. More important is the long cross-cut north from the Tonopah Extension shaft on the 1050-ft. which passes 530 ft. east of the Golden Anchor shaft, cutting through the intrusive rhyolite sheet, and penetrating the earlier andesite beneath the Black Mascot claim.

The workings of the Tonopah Extension mine lap the Golden Anchor territory on the south; the Tonopah Extension vein dips north, and the stopes on the 600-ft. level parallel the south boundary from which they are distant 250 ft. A 30-stamp mill, with a capacity of 135 tons per day, is now in process of construction on the Tonopah Extension.

RYE VALLEY GOLD MINES, OREGON.

Written for the MINING AND SCIENTIFIC PRESS
By AUGUSTE MATHEZ.

A few miles across the Idaho border, in Oregon, between Huntington and Baker City, is an interesting gold district, practically unknown except locally. The camp is controlled by the Commercial Mining Co., of Portland, Oregon. The postoffice address of the mine is Rye Valley. From both Huntington and Baker City are good wagon-roads to the mine. The interesting features of the property are the unusual widths of vein and high assay value of the ore, as far as developed. Near by is the old placer field of Mormon basin, some of the gold from which undoubtedly came from the lode-mines now being operated. It was these placer-fields that attracted the attention eight years ago of the representatives of some commercial travelers who had organized a prospecting company called the 'Commercial'. They bought some prospects, located others, and developed



Entrance to Tunnel Rainbow Claim.

what is known as the Rainbow mine. It is spoken of as follows on pages 289 and 290 of the United States Geological Survey, Volume 1908, Production of Gold, Silver, etc., in 1907:

"Mormon Basin district mines are mostly in Malheur county, but there is one important property which lies just over the border in Baker county. This is the Commercial Mining Co. (Rainbow) mine, which has a mill of 19 stamps, consisting of one battery of 5 stamps and 14 individual stamps. The mine is a large producer."

The gold in the Rainbow mine is in a basalt dike 300 ft. wide, between a limestone foot-wall and granite hanging wall. The whole dike assays \$2.40 gold per ton, and there are two 30-ft. widths in it that yield \$3.10 gold per ton. On the foot-wall side of the dike a quartz enrichment occurred, generally accompanied by a more porphyritic structure of the basalt, due to the slower cooling of the mass, and, therefore, a more perfect crystallization of its constituent minerals occurred. The interior rock of the dike is generally fine grained, and through the microscope shows characteristic basalt needles. The silica content is 52%. High assay values occur in chimneys or shoots along the foot-wall, averaging between 200 and 300 ft. long, one of these having a width of 10 ft. and a length of 240, with an average of \$36 gold per ton. Beautiful free-gold specimens occur in this shoot, containing specks of gold the

size of a pea. To a depth of 200 ft. below the surface the ore is free-milling; but at 300 ft. it has changed into an arsenical iron pyrite of considerably greater width, though assaying only \$10 per ton. It is an excellent concentrating ore. The 400-ft. level shows that the silicification extends to that depth. The company has just begun driving.

The history of the mine is interesting and odd. As stated before, about eight years ago some commercial travelers living in Portland decided to go into the prospecting business, and selected one of their number, W. E. King, the present manager of the mine, to go into the field. The result was his purchase of some prospects which he has developed into the present mine. Gold was found from the start, and hence the company's oddly constructed mill of seven 2-stamp batteries and one 5-stamp battery, the batteries being added as required. Up to date the mine has produced \$280,000 of gold bullion. No account has been kept of the amount of ore treated, but there are about 30,000 tons of tailing of an assay value of \$3.50 per ton. The mill is equipped with concentrating tables, but not over 6 to 10 tons of concentrate are made per month. The mill has a capacity of 40 tons daily.

Other companies are operating in the district, with apparent success, and there is reason to believe that this may become a prominent gold camp. Three thousand dollars in gold was recently taken out of a surface pocket on the Osceola claim, situated between the Humboldt mine and the Rainbow claim, belonging to the Commercial company. Some of the coarsest of the gold was broken from the rock, the largest pieces weighing over an ounce, and were melted in the Commercial company's assay office. In this clean-up 108 oz. were melted, assaying 652 fine.

CARBURETORS FOR GAS-ENGINES AT MINES.

Written for the MINING AND SCIENTIFIC PRESS
By E. N. PERCY.

Too often a gas-engine, primarily constructed for pumping, or marine work, or for farm use is sold for mining purposes, and connected to hoists, rock-crushers, air-compressors, or other machines, wholly without reference to its flexibility, weight of fly-wheel, or suitability for the duty. Then the miner and sales-agent both wonder why the engine is so cranky, why the belts break, why the governor will not work, and things in general are unsatisfactory. While the jackets are frequently found choked with lime deposits, the power low because of high altitudes, and the engine unsuited to work in hand by having too high or too low a speed, unsuitable fly-wheels, or the whole construction too light and cheap for the work, the most common trouble is with the carburetor. In the first place, mining calls for more carburetor-action than any other class of work; in the second place, the practical miner is more skillful at other things than with carburetors, and there is nothing that can be seen when a carburetor is cranky.

Rock-crushers, air-compressors, hoists, and other mining machinery are all of a class where the load varies suddenly, which is hard on a carburetor.

Most gas-engine manufacturers make their own

carburetors, with more or less success. Many a fine engine would give better satisfaction if equipped with a carburetor made by people who made nothing else. It is easy to make a gasoline engine run with almost any carburetor, or even by spraying a little gasoline into the pipe; but it takes the best of carburetors to control an engine under all speeds and conditions, with sudden slow-downs, and sudden opening of the throttle, in the case of a hoist. It is easy to get and adjust carburetors that will do this to the last word, but not by guessing. 'Hit and miss' is a satisfactory way of governing an engine for constant speed, but for careful governing under all conditions, and varying speed, as with a hoist, the throttle or gas-valve must be resorted to.

A hoisting engine that is to be shipped to a high, cold, altitude, that at times is very warm, should be throttle-governed, should have the best possible carburetor, and the compression should be increased $2\frac{1}{2}\%$ for each 1000 ft. of elevation. Under these conditions, it will give the same power as at sea-level. Every provision should be made to pre-heat the ingoing air to the carburetor; also, the carburetor might be jacketed with warm circulating water. Any high-grade carburetor can be purchased with or without a jacket. It should be so arranged that the warm air and jacket-water may be shut off in warm weather. Provision should be made for the inlet pipes to be kept warm, either by having them close to the engine, or by water-jacketing them. Assuming in cold weather, that the engine has just hoisted a load, and is left running idle for some time, the pipes being very cold, a part of the gasoline is being condensed all the time, because it goes through the pipes so slowly. A sudden call comes to hoist; perhaps a man's life depends on it; the throttle is thrown open, the air at increased velocity picks up all the loose gasoline on the sides of the pipe, the mixture is so rich that it will not burn, and the engine chokes or stops, and must be gradually brought up to speed. The gasoline-pipes from the carburetor to the cylinders should be comparatively small on a mine-hoist, so that the gasoline is always in suspension, even at slow speeds; but this speed should not exceed 20,000 ft. per minute at working load, or the rarification at high altitudes will be excessive and cut down the power; but in spite of this it is customary to send out stock engines for this work, with large pipes, and stock carburetors intended for one speed only. In these cases, it is better to keep the engine at one speed and to govern with the spark, but this is hard on the exhaust-valves, and soon burns them up. The right solution is to get a proper carburetor, that feeds the same mixture at all speeds.

A good carburetor should be jacketed, if necessary, for the work; should have main and auxiliary air-inlets, both capable of adjustment separately from the throttle, a needle-valve or changeable nozzle-tube, and an adjustment for varying the level of the gasoline in the carburetor. This latter is an important point, because, first, the level never is the same for different conditions, and second, if it is not possible to adjust this, the carburetor will refuse to work properly when the levers are so worn that the level changes. The carburetor is then said to be 'worn

out', when, as a matter of fact, there is nothing in a carburetor to wear out, if this slight wear can be taken up. But as the movement of the needle-valve is to be measured in thousandths of an inch, a slight wear will throw out the entire action of the carburetor, yet few makes, even of the best known carburetors, have this adjustment. Also, the needle should be heavy, should slide in heavy guides, and be a ground-fit; too often, it is merely a pointed piece of wire, and if a carburetor drips any gasoline, it is a sign that this valve leaks, and most carburetors do. A leaky carburetor cannot do proper work, particularly at low speed; and this is the reason why an engine running slowly will frequently die down and stop, as the mixture gradually enriches through the leakage.

These remarks are only intended to apply to the highest class of work, with every call for slow speed, quick opening of the throttle, and the like, as it is perfectly possible to run a gasoline engine with a squirt can, or mixing valve, or a teaspoon, and obtain a certain class of result.

DEBRIS CONTROL IN THE SACRAMENTO VALLEY.

By A. D. FOOTE.

*In the matter of barriers for holding back the mining débris and other wash from the mountains, it may be thought that the attempts made by the State of California in the Yuba tend to discourage more work in that direction. The work done, however, should be remembered rather as a lesson well learned, to be used to future advantage. The breaching of these barriers was caused by undermining, that is, the water, after passing over the barrier, dug a hole on the lower side of it, and worked back underneath until the barrier fell from want of support. A hint may be taken from the English engineers in India; for a wall may be carried down into the river-bed on the lower side of the barrier far enough to prevent this undermining. This would remedy the immediate and local danger to the barriers, but there is a general action going on which must be remedied also. It is so well known as to need no comment, that rivers if left to themselves are eternally flattening their grade. That is, they are moving whatever forms their bottoms along down stream in the usual course of nature, and the steeper the grade the greater the action. If, therefore, some extraordinary cause fills up a river and makes its bed steeper, this cutting action will become rapid, and if, in addition to this, at a certain point in the river, all material coming from above be stopped, and held, then the cutting action below this point will be much more rapid, because, as the material is moved along, there is no other from above to take its place.

If barriers are placed in the Feather and Yuba rivers near the hills only, the movement of the vast accumulation of débris below the barriers will simply be accelerated, and they will pass downward into the Sacramento and soon undermine the barriers. As this material should not be moved into the Sacra-

*Abstract from 'Redemption of the Great Valley of California'. *Proceedings Am. Soc. C. E.*

mento, and as it is desirable to have barriers in order to prevent more *débris* coming from the hills, they must be erected at intervals all the way from the Sacramento to the upper barriers; this will break the river grade into steps, with reaches between so nearly flat as to prevent the movement of the coarse *débris* forming their bottoms. This would lessen the velocity of the current and require higher levees to hold the floods. The excess of the floods must be turned into the basins and pass off through the escape channels.

In building these barriers, shown in Fig. 1, it is proposed to use the cement grouting method for a large portion of the structure. The upper barrier may be added to, as needed, for generations to come.

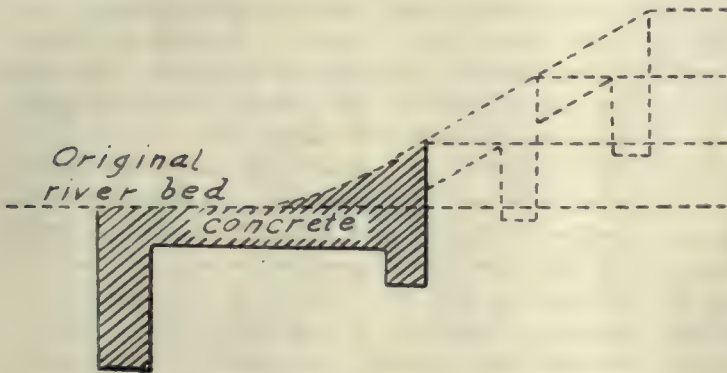


Fig. 1.

miner, who, when he puts in his 'undercurrents', as he calls them (for an entirely different purpose), points the way whereby the lower strata or heaviest silt, rolling along the bottom of a channel, may be diverted and carried away. The sketch, Fig. 2, shows the process better than it can be described. The secret of it is that the slot or exit orifice extends entirely across the bottom of the channel, and the velocity of the water through this orifice is not retarded by the sidewise discharge channel underneath. By a suitable device to vary the width of the exit orifice, any desired quantity of the heavier silt may be removed. The only mishap it is subject to in working is that it may get clogged by water-logged sticks and leaves rolling along the bottom with the silt. Opening the orifice wide for an instant will generally clear it. It is thought a trap of this kind may be placed in the heavier silt-bearing streams (they might be built into the flat portion of a barrier) where sufficient grade can be found, and convey the semi-liquid silt in small flumes where needed.

Finally, in working for the benefit of the tiller of the soil, the placer mine is reached. With the barriers in the streams to hold the coarser part of the miners' *débris*, the finer silt goes to the soil, and the farmer gets more gold out of it, through his crop, than the miner in his riffles. It can be demonstrated in hundreds of instances among the foothills, that enormous crops are produced on soil made entirely from the 'slickens' of the mines, and even the raw slime from the stamp-mills, collected in terraces in shallow gulches by little brush dams. It seems as if the raw rock, so finely ground, presented its potash and phosphorus to vegetation in a form that can be readily assimilated. It is not probable that placer mining will ever become as large an industry as it

was before it was stopped by law, but any placer mining will benefit the farmer. At the same time it will throw more or less coarse material into the stream-beds, and this must be retained by raising the barriers oftener than would otherwise be required. It would be but reasonable, therefore, that the placer miner be taxed sufficiently to pay for the increased work required at the barriers, even if his silt does enrich the valley lands.

Timber varies in strength with moisture-content. Tests show that the strength remains practically constant above 35% moisture. For example, the bending strength of loblolly pine ran down from 14,000 lb. per square inch when dry to 7800 lb. at 40%, beyond which no further weakening was shown by specimens in which the moisture was at the fibre-saturation point. The 'free-water' in timber does not affect its strength.

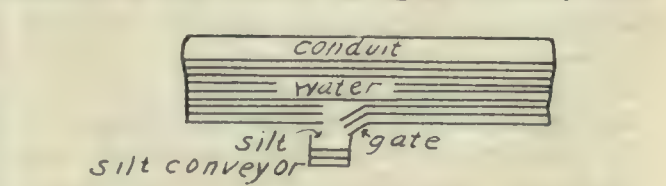


Fig. 2.

As soon as the side streams entering the valley are placed under control, it is believed that the heavier silt following along the bottom of these streams may be segregated and conveyed in small flumes to reclaim much waste land which is now useless, such as the beds of old sloughs, low places that have become alkaline, and small swamp areas which cannot easily be drained. In Italy and the south of France, large areas have been reclaimed by this method, or *colmatage*, as it is called, and much may be learned from their experience; but, in segregating this heavier silt, something may be learned from the intolerable placer

without endangering its stability, and, if the surface becomes worn appreciably, it will be neither difficult nor costly to spread a few feet of concrete over it, during the dry season, and this, if kept moist until it has set, will be as good as the original surface. The sand and gravel beds of the streams entering the Great Valley of the Sacramento are perfect material for forming cement conglomerate if cement grout is forced into it. The operation is quite simple and rapid. Pipe is driven into the river-bed, if possible by the water-jet method, to the depth required for the foundation, and a force-pump drives the grout into the interstices until they are full of cement which on hardening forms the solid concrete. The grout may be forced in within a radius of from 3 to 6 ft. from the pipe, depending on the porosity of the bed material. In this manner, broad and deep foundations may be constructed on which to build movable dams and regulators, on nearly every stream entering the valley, at a cost of less than half the usual estimates for such work. Near the centre of the valley, where clay or adobe occurs, this method cannot be used.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Modern Quicksilver Reduction.

The Editor:

Sir—In his interesting article on Huancavelica in your issue of October 23, Mr. Strauss stated in referring to losses in the reduction of quicksilver ore, that "in Idria 20% of the mercury produced was caught as metal in the condensers but the mercurial soot in the furnace is collected and treated separately." It may be noted in passing that the soot is formed in the condensers and not in the furnace. From the context, the inference may be drawn that most of the mercury in a quicksilver furnace is obtained from the soot, whereas, at least in American furnaces, 70% or more of the mercury runs out of the condensers as pure metal. Spirek, in the *Mining Magazine* of April, 1906, states that in 15 years at Monte Amiata, in Italy, the amount of mercury obtained from the soot was only 6.5% of the total production; and that the total loss of mercury was only 4 per cent.

H. W. TURNER.

San Francisco, November 2.

Ship Subsidies.

The Editor:

Sir—I am not in favor of a ship subsidy, in the general sense. It is claimed by Mr. Aldrich and his supporters that an average tariff of 47% is needed in order to prevent foreigners from underselling us in our own markets. What chance, then, do we stand in foreign markets, where our manufacturers receive no protection? The creation of a merchant marine is a dream, unless we lower our tariff wall, and put our cost of production upon the same plane as that of the rest of the world. Consumers in this country are paying three billion dollars more annually for the manufactured products which they consume than they would if there were no tariff. Of this three billion dollars imposed as a tax upon the American consumers the Government gets, in the shape of taxation, only three hundred millions, and the manufacturers get the rest.

The only practicable way of increasing our merchant marine is for the Government itself to build the ships which are required for naval transport, scouts, and an auxiliary navy, and to keep them employed in times of peace by leasing them to private companies. These we can use in opening up new routes of trade, such as those proposed to the Orient, South America, and Africa, utilizing the ships as training schools for the Naval Reserve. We have a preponderance of fighting ships as compared with our carrying ships, and the latter are as necessary to the Navy as the former. Construction of these ships as a part of our auxiliary navy could be justified, but payment of vast sums in the shape of subsidy to the identical private interests which are sustaining the present

policy of protective robbery cannot, in my opinion, be justified.

You will perceive from the above that no thanks are due to me for the consideration shown the resolution on encouragement of shipping which was passed favorably at the recent Mining Congress; if I had been there I should have opposed it.

FRANCIS G. NEWLANDS.

Reno, Nevada, October 24.

Slime Concentration.

The Editor:

Sir—Taking up the subject of slime concentration, with its accompanying queries so intelligently put forth by 'C' in a recent issue of your journal, I beg leave to submit the following data relating to a simple device for the recovery of fine 'float' mineral and mineral in suspension carried off by the clear water overflow from the settling boxes or mineral traps placed below the vanner floor.

A variety of devices is in use, each mill seeming to have its own, but the common practice is to place a series of shallow oblong boxes side by side, allowing the mineral-bearing waters to enter at one end, discharging into its neighbor at the opposite end, alternating through the series. This method looks effective, for, upon examining the boxes the bulk of the mineral is found in the first box, and in the last there is but little. If one will filter the discharge-water from the last box for an hour, he will be disillusionized, and perhaps elated, especially if it happens to assay more than 'two bits' per pound, and he will endeavor to devise some means of stopping it. Various filtering devices have been tried and proved successful, but they require much attention, and have to be destroyed when cleaned up, so that few mills bother with them. Hence this communication.

The principle that the following described device operates upon is gravity, aided by attraction. A reservoir is filled with clear water, large enough to present an absolutely tranquil surface, with a separate compartment for the mineral-laden water to discharge into, for the suspended mineral to settle in, and for the 'float' mineral to accumulate toward the side-walls of the compartment. Some of it will there agglomerate and ultimately settle; the balance will circulate as a slimy scum along the walls of this compartment, retained there because, in order to pass to the discharge it must settle vertically through quiet water some 2 ft. 6 in. deep. This apparatus should be constructed preferably of concrete, but one may substitute wood and obtain the same results.

Build a tank 8 ft. wide by 16 long by 3 deep out of 2 by 12-in. plank, resting on 6 by 8-in. sills 3 ft. apart, the side-walls retained by 6 by 6-in. posts mortised into sills and caps, or otherwise secured at the option of the builder. Designating the end of the tank nearest the mill the intake, proceed by measuring off five spaces along the side-walls 2 ft. apart, commencing at the discharge end of the tank. Next cut 20 pieces of 2 by 4 each 3 ft. long, and nail two of them to the side-walls vertically at each space previously measured, placing each piece 11

in. on either side of the space-line, and parallel with the same, forming guides for floating partitions which may be easily raised or lowered. Next place a piece $1\frac{1}{2}$ in. long in the bottom of the first set of guides nearest to the discharge end of the tank; in the next pair of guides place $2\frac{1}{2}$ -in. pieces on the bottom, and so on with each succeeding set, increasing the length 1 in. Then build partitions of 2 by 12-in. planking, fitting each length snugly but not tight, leaving it to be raised. This means cutting 10 pieces of 2 by 12, scant 8 ft. long, and five pieces of the same length, but decreasing an inch in width to correspond with rests in the guide-bottoms. Surface the edges and secure them together by spiking on three pieces of 2 by 6 of the same length as the width of the partition, one at each end, and one in the middle.

Means for emptying the tank and cleaning up are provided as follows: bore a hole $1\frac{1}{16}$ in. diam. in the bottom of the tank about 1 ft. from the wall at the discharge end, which, if the bottom is level, may be anywhere across the width, but if not level, put it at the low side as above. Next take a piece of 1-in. pipe about 7 in. long, thread one end for an ell, thread the other end back $3\frac{1}{2}$ in., dope the threads, put on the ell, and then screw the long-threaded end through the bottom of the tank from the outside, allowing $1\frac{1}{4}$ in. of threads to come through. Connect a short piece of 1-in. hose 4 ft. long, the loose end attached to a short block as a buoy, and when ready to empty, a funnel with some filter cloth stretched across the mouth may be inserted in the hose as a safeguard. Cut a piece of pipe long enough to extend from the ell to the outside line of the tank-bottom, put on a gate-valve, and connect it with the ell. Fill the tank with clear water, leaving out the partitions until the tank has swelled tight and all leaks are checked. This may take two or three days and is important. The tank being in readiness, turn in the amount of clear water nominally discharging from the mineral boxes, and let the tank overflow. This will indicate the inaccuracies of measurement. Then dress off an average of $\frac{5}{8}$ in. of the top of the discharge end of the tank, finishing with a draw-knife. The prime object is to have the water flow over the edge in a thin even sheet from side to side. Keep a small piece of window-glass ready. It will be found useful in removing any swelling of the wood retarding the evenness of the flow.

Set each partition in the proper guides, and, with the valve closed tight, no leaks developed, and the water overflowing uniformly, shut off the water and lead in the mineral-bearing water from the mill.

All the mineral will be found practically in the large head-compartment, 'float' and all. It cannot get out; it must go to the bottom. It will stand sudden excessive flows caused by washing down the concentrator floor. If the head-compartment fills to near the bottom edge of the first partition, carefully draw it out, thus increasing the capacity.

To clean up, which should not be done too often, select a time when the mill is shut down, and open the bottom valve, letting the water out slowly through the floating hose. This will empty it to

within 2 in. of the bottom, possibly a little less, but by boring a $\frac{1}{2}$ -in. hole through the discharge end from the outside on a level with the bottom, the tank may be drained dry, taking care to filter the last carefully. Let it dry a day if possible; then shovel it out, brush and sweep it as clean as possible, plug the bored hole, fill the tank with clear water to overflowing, and replace partitions.

In conclusion, for the benefit of those conservative gentlemen who want to make a test, take a spare mineral box, put in a partition 2 ft. from the end, extending to within 1 in. of the bottom, fill to overflowing at the opposite end from the partition, by having the partition-end raised $\frac{1}{8}$ in. above the level, and let just a little water flow steadily; take a handful of slime from a 'save-all' and throw it in the compartment, and notice where it goes.

FRANK R. PORTER.

Highland Springs, California, September 2.

Researches Upon Cripple Creek Telluride Ore.

The Editor:

Sir—As the MINING AND SCIENTIFIC PRESS was one of several American journals that published an article 'edited by Thomas B. Crowe', which appeared in the Chemical, Metallurgical & Mining Society's *Journal*, I beg to hand you herewith a copy of a communication that I am addressing to the society referred to, which might interest your readers.

"Chemical, Metallurgical & Mining Society,
of South Africa,
Johannesburg, South Africa.

Gentlemen—Several American mining journals having published an article 'edited by Thomas B. Crowe', which evidently appeared in your journal, we have thought it might interest your membership to know that the process which Mr. Crowe describes, is not one of his invention as you might infer, but the invention of John Collins Clancy. It is the subject of Transvaal Patent, No. 90, of 1909. Further, the same Thomas B. Crowe was Mr. Clancy's second assistant during a portion of the time that Mr. Clancy was the chief chemist of the Portland Gold Mining Co., at the time that Mr. Clancy successfully demonstrated the working of his process for the treatment of telluride ores on a large commercial scale without roasting. It was during this period of association that Mr. Clancy gave Mr. Crowe access to all of his books and data.

"It would hardly seem necessary to add anything further than to say that the Portland company is working under a written executed license-agreement from Mr. Clancy to use his process, and that the successful operation of the new 300-ton plant which that company is now building on its own mine at Victor, Colorado, is based upon the success of the exhaustive demonstrations made with the Clancy non-roasting process."

HENRY B. HAIGH.

Grahamite is found in Oklahoma filling fissures in the form of veins or dikes that cut across and extend with the bedding. In the Ouachita mountains it occurs in both Ordovician and Carboniferous rocks.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Selenium is one of the rare elements whose properties have given it considerable interest. In the dark it is a poor conductor of electricity, but in the light it becomes a good conductor, and on account of this peculiarity it is used in a number of electrical devices. It has been used in telephoning along a ray of light, and also in transmitting pictures by telegraph.

Denatured alcohol costs more than gasoline and the quantity of denatured alcohol consumed by an alcohol engine as ordinarily constructed and operated is in general relatively greater than the quantity of gasoline consumed by a gasoline engine of the same type. It seems reasonable to expect a greater general improvement in alcohol engines than in gasoline engines.

Esmeraldite was described first by A. S. Eakle. It is a hydrous ferric oxide from Esmeralda county, Nevada. It occurs in small pod-shaped masses enclosed in a yellowish brown earthy and highly silicious limonite. The fracture is conchoidal and the mineral very brittle. Hardness 2.5, gravity 2.578, lustre vitreous, color coal-black, streak yellowish brown. The mineral resembles melanosiderite.

Strength of current employed in American copper refineries is 12 to 15 amperes per square foot of cathode surface. The voltage is increased with the number of tanks in series. As there is danger of loss from leakage under high voltage it is not safe to supply a large number of tanks from a single-feed wire. The theoretical pressure of 1.16 volts required to precipitate copper from the sulphate solution is reduced in practice to $\frac{1}{6}$ to $\frac{1}{3}$ volt, by virtue of the soluble anode.

Monazite is one of the minerals which, for a long time, was considered rather rare in its occurrence, but, upon a commercial demand arising for it, prospectors and engineers soon found large deposits of it in the Carolinas and Brazil, and the supply has always been able to meet the demand. During 1908 further sources of supply of monazite have been discovered and developed in Idaho. North and South Carolina, however, are the only States that have thus far put any monazite on the market.

Molasses is occasionally used as a boiler compound, but alone is dangerous if used in any quantity. Under boiler temperature and pressure it undergoes a complex decomposition. It gives rise to the formation of corrosive organic acids and causes a separation of carbon which is liable to deposit itself in the tubes. The theory on which the use of saccharine substances is based is that it causes the formation of soluble sucrares with the calcium salts present. However, at boiler temperatures and pressures the tricalcic sucrares and possibly the sesquicalcic sucrares would be formed. The precipitate, however, is light and remains in suspension if the circulation is good.

Concentration is an important factor in effecting a change of chemical activity. Thus the speed of interaction of a body, when other conditions are constant, is directly proportional to its concentration, that is, the closeness of the particles of the substance in the region of action. In the case of a gas, for example, when oxygen at 700° is compressed in contact with barium oxide, it unites with it to form barium dioxide; but when the pressure is reduced to an incomplete vacuum, oxygen is liberated, and the dioxide is reduced to monoxide.

Cobalt occurs at many places in the United States, but all of the 1908 output came from Fredericktown, Missouri, where it is produced in connection with nickel and copper from concentrate obtained in mining for lead. The principal uses of cobalt are in making glass and pottery. Cobalt oxide imparts a beautiful blue color to glass. Some salts of cobalt change in color on absorbing water, being blue when dry, but pink when damp. A familiar hygrometer making use of this property is a doll whose dress is blue in dry weather and pink in damp weather.

Combustion of nitrogen in oxygen is an equilibrium for each temperature between the nitric oxide produced and the nitrogen and oxygen, hence the amount of nitric oxide produced at any temperature cannot exceed that corresponding to the state of equilibrium for the particular temperature. The following figures give the percentage produced: at 2200°C. the gases contain 1% nitric oxide, at 2571°C. 2%, at 2854°C. 3%, and at 3327°C. 5%. Therefore the air must be heated to as high a temperature, and the products cooled as rapidly, as possible to reduce the decomposition of the nitric oxide to free nitrogen and oxygen to a minimum.

Knots in timber are not necessarily a cause of weakness. When situated near the neutral plane they may act as pins, and tend to strengthen a beam against failure in longitudinal shear. Knots in the top of a stick are not so weakening as those in the bottom. A comparatively small knot situated near enough to the lower edge of a beam to turn the grain off is more harmful than a larger knot so placed as to allow the grain to be continuous in passing. Tests recently made under Government auspices confirm the fact that the position of a knot is a much more important factor than its size, and knots on the tension face of a beam should be avoided.

Tellurium, which is classed as a metalloid, is supplied as a chemical curiosity in the form of a black powder and as a metallic-looking substance with a fine columnar crystal form, in color somewhat resembling tin. No use has yet been discovered for tellurium, and many tons of this element are annually wasted in Western mining districts. Some of the compounds of tellurium have an offensive, all-pervading, and ineradicable odor. Chemists who have been experimenting with tellurium say that after three months exposure to sun, wind, and rain the clothing worn by them while they were making these experiments, although it had not come into contact with the tellurium compound, was still so unpleasantly scented that it had to be destroyed.

Special Correspondence.

NOME, ALASKA.

Water Shortage. — Output. — Ditch Systems — Kougarak District. — Pioneer Mine. — Iditarod. — Discovery on Sweepstake. — Winter Plans. — Quartz Mining.

The mining season for 1909 has just closed and the output is nearly one million dollars less than for last year. This shortage is due in part to the fact that the rich Third Beach pay-streak which has contributed so largely to the output during the last four years is now practically exhausted, and in part to the fact that this has been the driest season in the history of mining on Seward Peninsula. The snowfall of last winter was exceptionally light and it melted before mining operations were fairly under way. Only a few light showers of rain fell until about the middle of September. Following the first heavy rains the mountains and higher hills became covered with snow and the temperature was soon lowered to the freezing point in the valleys. The miners derived but little real benefit from the precipitation. By September 25, owing to the cold

ditch enterprises, notably the Taylor Creek ditch in the Kougarak district, the Fairhaven ditch in the Inmachuk River district, the Candle Hydraulic Co.'s ditch in the Candle Creek district, and several others of lesser note in different parts of the Peninsula brought large tracts of rich gold-bearing ground within the producing area, had it not been for the unwelcome fact that the lack of ample annual rainfall causes the sources of water-supply for these long and expensive canals to run almost dry, so that streams which ordinarily are scarcely fordable on horseback could be walked across during the past summer in one's Sunday shoes without getting wet.

The great Miocene ditch system, embracing fifty odd miles of main line and laterals, which delivers water from the heads of Nome and Snake rivers to the vicinity of Anvil creek, and which has a capacity of about 3000 miner's inches, was reduced to less than 300 in. during the latter part of this season. The Seward ditch, about 40 miles in length, taking its water from Nome river and delivering it around the foot of Anvil mountain, was likewise reduced to about one-fifth of its carrying capacity. The Topkok ditch, taking its water from Kootcheblok and Big Skookum to the immensely rich diggings on Daniels creek, was practically dry after the snow-water ran off in June and until the late

September rain. The Ophir creek and Parantulik river ditch system, belonging to the Wild Goose Mining & Trading Co. and supplying water to Ophir creek, maintained the steadiest supply and highest efficiency of all the ditches in the Peninsula. Its supply was probably never less than 60% of its carrying capacity, which is approximately 3000 miner's inches, and consequently the Ophir creek output for this season was normal, a fact which cannot be claimed for any other district depending upon ditch water.

Although no data are obtainable dating back further than the discovery of gold on Anvil creek in the summer of 1898, basing opinion upon the climatic conditions which prevailed during the first nine years of the history of mining on Seward Peninsula, it is confidently believed that the drought of the past two seasons is exceptional. In spite of the discouraging conditions from which they are emerging at the end of this season, the future still holds a rainbow of promise for the majority of those who have



Nome Beach.

northerly breezes sweeping down over the snow-capped hills, practically all sluicing operations are discontinued, except on the various dredges scattered about the Peninsula, most of which continued to run until the third week in October. The total gold shipped since the opening of navigation, as shown by the records of the customs office, to which reports are made by all the banks and by the post office, is \$3,975,196.58, and as compared with the previous five years the figures are as follows: 1904, \$3,818,002.82; 1905, \$4,648,855.92; 1906, \$7,290,724.83; 1907, \$6,612,489.72; 1908, \$4,937,253.51; 1909, \$3,975,196.58. It is estimated by the banks of Nome that at least 10% of the gold produced on Seward Peninsula is either shipped or taken to the outside direct by the producers and is not reported at the local customs office, though all gold sent by mail or by the banks is so reported. It will be observed that the output has steadily declined since 1906, which was the banner year for the famous Third Beach pay-streak. This showing, however, must not be taken to mean that Seward Peninsula has passed the zenith of its producing power and is on a permanent decline. On the contrary, it is firmly believed that the development of its vast gold-bearing areas is in its infancy and that soon its banner year will be annually eclipsed. As has been stated, this season was the driest in ten years that has elapsed since the discovery of gold on Anvil creek. Had it not been for this extraordinary drought the records would show far different results, even though the rich pay-streak of the Third Beach has been steadily on the wane. The completion since 1906 of several large

invested their money in ditch enterprises. The immediate effect, however, will probably be the complete cessation of further ditch building on the Peninsula until those already constructed have proved successful. In the meantime some effort is being made looking toward storage reservoirs, and particularly toward impounding snow over large areas in the basins and slopes at the heads of the ditch systems.

The Taylor Creek Ditch Co. in the Kougarak district has expended a great many thousands of dollars during the past season in constructing snow fences, which it is hoped will impound sufficient snow to be of material aid in maintaining a water-supply during a dry season. This company, which is managed by Andrew J. Stone, who is also one of its leading stockholders, owns many valuable claims along the Kougarak river and some of its tributaries and has expended during the last four seasons more than three-quarters of a million dollars in the purchase of claims and the construction of an extensive ditch system. Though but little actual mining has been done by the company so far, a large area has been prospected with very encouraging results, and Mr. Stone has now determined to provide against a future shortage of water which has so hindered his operations during the last two years, by the installation of an immense power plant on the lower Kougarak river about 12 miles below Igloo, where he proposes to generate electric power which will be transmitted to the vicinity of his mines, and with motor-driven pumps will supply water from the main river to his ditch system, through which it will be distributed to the various claims. Although the power

plant will be situated near the river the power will be derived from several streams which drain the north slope of the Sawtooth mountains. The waters of these several streams are to be conveyed through wooden flumes aggregating 11 miles in length to an immense glacial basin which forms a sort of amphitheatre at the head of one of the streams, and which by the building of a dam across the lower end will form a reservoir covering several hundred acres. The aggregate volume of water available at this point during the lowest water of the past season was 6000 miner's inches, according to measurements made by Daniel A. Jones, to whom I am indebted for this information. From the reservoir a pipe-line will be laid three miles down the slope to a point near the Kougarok river, giving a total fall of 1020 ft. Pelton wheels will be used and it is expected to generate at least 12,000 hp. The company will not only develop power for its own operations and its neighbors in the Kougarok, but will deliver power to the Nome, Solomon, and Council districts for use on dredges and other mining operations. It is estimated that the plant when completed will cost \$750,000. Mr. Stone's faith in the future of the Kougarok district as a great gold producer grows stronger each year despite the obstacles to be overcome, and he deserves great credit for the persistent effort he has put forth to develop this promising field.

Advantage has been taken of the extremely low water during the past summer to prospect the bed of the river in the upper stretches of the Kougarok, with the result that some rich gravel has been discovered. Dolan and McFadden, who were among the first to attempt mining this season on the main river, are reported to have mined \$160,000 by the pick and shovel method during the season, and many go so far as to say that a stretch of eight miles along the upper river is equal in richness to Nome's famous Anvil creek. The first stampede to the Kougarok River district was in 1899 by prospectors from Nome and Council City districts, and the first real effort at mining was made in the season of 1901. This proved more or less of a failure, due in part to irregularities of the pay-streak on the creeks on which the attempt to mine was then made, and in part to the fact that the creeks upon which the pay had been discovered furnished little or no water during the larger part of the summer season. Then came an era of ditch building, and several big ditches were constructed from the head-waters of the river and its larger tributaries to various localities where pay dirt had been found. Following this ditch construction the discouraging fact was realized that the water-supply was limited except in season of heavy precipitation. Taken all together the history of Kougarok district has been one of much promise with very little performance. Nevertheless, it is beyond cavil that there is a vast amount of gold-bearing gravel in the basin of the Kougarok, and the larger stream-beds will probably furnish dredging ground for many successful ventures. The smaller stream-beds and benches will give ample opportunity for power consumption from Mr. Stone's big power plant or any other.

Mining operations in the vicinity of Nome, although more active than elsewhere on the Peninsula, have been quieter during the past season than for the last three or four. The Pioneer Mining Co., working the rich area lying between Little and Anvil creeks, have, as usual, worked a large force of men and produced from their winter dumps and from their open-cut operations near Discovery on Anvil creek during the summer, about 20% of the total gold production for Seward Peninsula this season. Although reworking No. 1 Above Discovery on Anvil with wheel scrapers delivering to an elevated sluice-line, their chief operations were conducted on an old channel of Anvil creek lying off No. 1 and 2 Below Discovery. This channel is about 20 ft. deep from the present surface, 60 to 80 ft. wide within the bedrock rims, is covered by from 8 to 12 ft. of tundra muck, and is permanently frozen. Their method of working is to ground-sluice the surface muck from an area equal to the width of the channel by about 300 ft. in length. A pit is then thawed and excavated to a depth of 6 ft. below the bedrock surface in the centre of this block, and a self-dumping hoist is set up with the bucket dropping into this

pit. A line of sluices is built on the rim at sufficient elevation to provide tailing room for the entire block. At the beginning, operations are facilitated by thawing the gravel banks around the open pit with steam-points. The exposed gravel thaws rapidly, however, in the warm summer air, and the operations are quickly extended to all parts of the ground-sluiced area by radiating steel-rail tracks upon which half-yard cars are handled by two men. The gravel is shoveled into the cars, pushed to the pit, and dumped into the bucket of the self-dumper. It is then hoisted and dumped into a mud box at the head of the sluices and is washed with about 200 miner's inches of water. The surface of the ground-sluiced area is reduced in slices of about 3 ft. in depth. When the limits of the area have been reached, the tracks are lowered and a new slice is begun. The pay extends into the shattered surface of the schist bedrock from 2 to 4 ft., and this is usually the richest slice. A force of 20 men, including the foreman and hoist man, is used on each shift, and two shifts of 10 hours each are worked. The average number of cars handled on each shift is 400, representing approximately 400 cu. yd. per day of 24 hours. The average daily gross output of each plant is about \$2000. This company, under the able management of Jafet Lindeberg, its president and one of the first discoverers of gold on the Peninsula, has maintained the enviable position of leading dividend payer since the mining began here.

E. L. Blanck, Charles Vogel, and Howard Ames, operating the McKay Bench adjoining the Pioneer Mining Co.'s ground, under lease from McKay and Nussler, the owners, were fortunate enough to uncover the same rich channel that has been so profitable for the Pioneer Mining Co. After sinking several shafts and proving the continuity of the pay-streak through their claim, they accepted an offer of \$75,000 for their lease and turned it over to the Pioneer Mining Co. in the early part of September. The Bessie Bench claim owned by Boncher, Greenberg & Foster, which was flooded early in the summer by accidentally breaking through from the frozen ground in which drifting operations were being conducted, into the adjacent thawed ground, has again resumed operations. A rather novel plan was adopted to stop the heavy inrush of water through the gap which had been opened to the thawed ground. A series of holes was drilled from the surface intersecting the drift which had let in the water. A refrigerator plant was secured from one of the cold-storage companies of Nome, and through return pipes lowered into the drill-holes a circulation of ammonia gas was kept up for several days. This froze a solid block of ice, filling the drift, and completely cutting off the water. The mine was then pumped out and operations were resumed under the same conditions as before the accident.

Much interest is being taken by Nome people in the new strike on the Iditarod, a tributary of the Innoko river. Reports have been reaching here for more than a month past to the effect that a strike of extraordinary extent and richness has been made. Many of the miners and prospectors of this district have already joined in the rush to the new diggings and others are preparing to go as soon as the snow falls and sleighing is possible. Some of the business men have also caught the fever of the stampede, and stocks of merchandise are scattered all along the trail between here and the new diggings. Schied & Co., machinists and hardware dealers of Nome, are sending 200 tons of groceries and prospectors' supplies up the Innoko to Dishkakiet, to which point they expect the miners to come to buy their supplies. John Tesack and David R. Jekel, who have long been connected with the Pacific Cold Storage Co. of Nome, are also taking a \$10,000 stock of groceries and other merchandise to the new diggings. They expect to land it on the Iditarod in the centre of the new excitement. Ramps Peterson, another Nomeite, is somewhere on the lower Innoko at this time with a stock of the inevitable wet goods. The scene of the new strike is approximately 375 miles from Holy Cross mission of the Yukon river, and is reached by traversing the Shageluk slough 125 miles to the mouth of the Innoko river, thence 25 miles up the Innoko to the mouth of the Iditarod, thence 225 miles up the

Iditarod to Otter creek, which is the centre of the present excitement. Otter creek is approximately 75 miles across country from Dishkakot on the Innoko. The Shageluk slough and the Innoko river to the mouth of the Iditarod are navigable for river steamers, but no reliable information as to the navigability of the Iditarod is available. Reports reaching here from there are conflicting as to the richness of the strike, but all agree that the gold-bearing gravel is extensive in area. Some have said that pans of \$1.25 to \$2.65 have been taken from some of the prospect holes, and others that 5 to 10c. per pan had been found uniformly in a body of gravel 400 to 600 ft. in width and several miles long. It is claimed that numerous prospect holes have been sunk and all show workable ground. The gravel beds are from 5 to 10 ft. deep. As another evidence of the faith some of our people have in the new diggings, the Innoko Telephone & Telegraph Co. has been organized by O. A. Margraf, John Reik, J. M. Sloane, Ed. Young, and others, and a line is now being constructed from Kaltag on



Nome in Winter.

the Yukon river across country to Dishkakot on the Innoko, thence to Ophir creek and Otter creek. Two hundred miles of wire, two boxes of telephones, and all necessary insulators and other equipment were shipped from here to Unalakleet on Norton sound two weeks ago. As soon as the trails are in condition this material will be transported over the portage 90 miles to Kaltag, and it is claimed the line will be in working order from Kaltag to Dishkakot by January 1 next. This line will put the new diggings into touch with the outside world over the Signal Service line along the Yukon.

Another discovery of some promise has lately been made on Sweepstake creek, a tributary of the Koyuk river, which empties into the head of Norton bay. A party headed by Robert Brown, one of the pioneers of the Kougark, spent a part of the past summer in that district and returned here about October 1 with the report that they had discovered good prospects on Sweepstake creek. Brown has bought a big winter outfit and will return to the new find immediately. Another party headed by Sam Smith, an old timer here, is also taking a winter's outfit to the same locality. These diggings lie in the belt of country between the Council City and Candle Creek districts, and interesting developments are expected. Gerald O'Shea, the well known mine manager, who for the last two seasons has had charge of the Topkok Ditch Co.'s operations on Daniels creek, returned a few days ago from a trip to the Innachuk River district, over on the Arctic slope, with the news that the Box brothers have struck good pay driving in an old river channel under the great lava-bed which stretches for miles along the divide separating the Innachuck and Kugruk rivers. They have driven an adit from an outcropping rim a distance of 300 ft., attaining a depth of 150 ft. under the lava-cap. This follows the bed of the old channel, and they are now cross-cutting at the end of the adit and finding pay dirt. This old buried river was more than

a quarter of a mile wide and now lies under hundreds of feet of lava.

Dredging on the Seward Peninsula has been active this season, and with good results. Winter operations apparently will not be as active as formerly. Considerable prospecting is being undertaken, as usual, and some one may be lucky enough to uncover another bonanza pay-streak, but at present the known rich ground is quite limited in extent. This outlook has caused many of our prospectors and miners to stampede for the new strike on the Iditarod river, and many more, looking to a dull season, have gone to the outside for the winter. There will be about 1000 fewer people on the Peninsula this winter than last. The Nome district will furnish employment for about 200 miners, Candle and Kougark probably 100, and all other districts probably 100 more. A limited amount of work is being done on quartz mines. The Alaska Chief silver-lead mine on Lost river is working a small crew, and it is reported are meeting with encouraging prospects. The

Silseo antimony mine on Manila creek, a tributary of Nome river, is also working a small crew, and the Wheeler copper mine near Iron creek is working a few men. This property has a promising showing of copper carbonate outcropping at the surface, and the owners have shipped ten tons of this ore on one of the last boats to obtain a smelter test. Some work is also being done on the Ward copper prospect near the head of the Kougark river. It is said a 50-ton shipment of ore from this claim will be sent down over the snow-trail this winter to the terminus of the Seward Peninsula railroad on the Kougark to be shipped outside next spring. The Hurrah quartz mine, in which the Lane family has invested so much money, is still idle, although it was reported some time ago that Charles A. Ferrin, president of the Northern Mining & Trading Co., had secured an option on the mine and mill, and would operate it this winter. Some work is being done on the Lost river tin mine, owned by Crimm, Randt, and O'Brien, but the tin mines near Tin City, about which there was much stir a couple of years ago, seem to be numbered with the things that were. The McAllister gold prospect at the head of Nome river has lately had new

life infused into it by the striking of a pocket of ore showing much free gold.

WASHINGTON.

Supreme Court on Mining Titles in the Philippines. — Salton Sea Damages.—Water Power Census.

The United States Supreme Court recently decided the ownership of a gold mine in the Philippine Islands, and thus closed long drawn out litigation. The case was entitled *Reavis against Fianza*, the latter being a Filipino and the winner of the suit. The Supreme Court in effect held that the occupancy of land by a native of the Philippine Islands for a number of years forms a superior basis for a claim to the land than does settlement by an American. The property in controversy was a gold mine in Benguet Province, which had been operated for 50 years by the Fianza family, who are Igorrotes, without making any formal filing upon it. Reavis undertook to obtain a patent on the mine in 1901. The Philippine courts decided in favor of Fianza, and the decision of the Supreme Court sustains that finding. The opinion was by Justice Oliver Wendell Holmes, who said: "It sufficiently appears that the Fianza family had held the place in Igorrote fashion, and to deny them possession in favor of Western intruders probably would be to say that the natives had no rights on the statute that an American was bound to respect. It is suggested that the possession of Fianza was not under a claim of title, since he could have no title under Spanish law. But whatever may be the construction of Revised Statutes, Sec. 23, 32, the corresponding section of the Philippine Act cannot be taken to adopt from the local law any other requirement as to the possession than the length of time for which it must have obtained. Otherwise, in view of the Spanish and American laws before 1902, no rights could be recognized and the

section would be empty words." The decision of the California courts in the case of the New Liverpool Salt Co. against the California Development Co., in which the salt company was awarded damages to the extent of \$456,746 for alleged damages to its mines, may be reviewed by the Supreme Court. A writ asking for a re-hearing has been filed by the development company. The suit involved a controversy over the question of the responsibility for the overflow of the Colorado river into the Salton sink in 1905, by which the salt mines of the New Liverpool company were badly damaged. It was said by the salt company that the overflow was due to carelessness of the development company in the construction of the head-gates of its irrigation ditches, and the United States Circuit Court for the southern district of California held such to be the case.

A report just issued by the United States Geological Survey contains some interesting information regarding the water-power available in the United States. M. O'Leighton, the chief hydrographer of the Survey, makes the statement that flood damage in this country has increased progressively from \$45,000,000 in 1900 to \$237,000,000 in 1908. Mr. Leighton also discusses the developed and undeveloped water-powers of the country. Out of about 37,000,000 hp. available at the minimum flow of streams, but little more than 5,000,000 has been developed, or about one-seventh of the minimum available. A complete census of water-powers has been taken, but the undeveloped powers are determinable only by estimate. The State of New York has the largest development, with 885,862 hp., California standing next, with 466,774. The section of the country furnishing the greatest possibilities of water-power development is the northern Pacific region, including the basins of Columbia and the Sacramento rivers. Frederick H. Newell, director of the Reclamation Service, states that the irrigated land of the United States has increased from 3,631,381 acres in 1889 to about 11,000,000 acres in 1907, and fixes the limit of irrigable area in the arid region at about 45,000,000 acres, or more than four times the area now irrigated.

JOHANNESBURG, TRANSVAAL.

Diamond Market. — Government Mining Leases. — Grootvlei Shaft-Sinking. — Record Driving. — Gold Output for 1909. — Oil in Orange River Colony.

A discussion in which five or six months elapses between statement and reply is apt to become tame unless the theme is peculiarly interesting. The unscientific debate which has been taking place between the diamond companies of South Africa during the past year has only been saved from the stigma of pettiness by the inherent importance of the subject to all concerned in the welfare of the country. The controversy has its sources in three colonies, wherein operate three great concerns constituting the dominating factors in the world's diamond market. At the end of last year the chairman of De Beers (Cape Colony) told us forcibly of the market's critical situation and of his company's cautious policy of retrenchment, adopted—with painful results—to aid its recovery. Also of the indiscreet and suicidal policy of large-scale production in the face of the small demand, persistently pursued by the (Transvaal) Premier company. Then, a month or so later, the Board of the Premier responds with a forcible form of *tu quoque*, which may be summarized as an accusation against De Beers of responsibility for the overproduction which caused the crisis. Now, the chairman of the New Jagersfontein, Mr. Harris, denies that either De Beers or its Orange River Colony ally ever overcrowded the market, and was able to claim, as a result of the prudent policy followed by the older corporations, that "the diamond market has quite recovered" and that "the demand is now almost as strong as it was during the three years ending June 30, 1907." The renewal of steady business is dated from January 1, 1909, while the improvement in sales was conspicuous from July.

The announcement by the Transvaal Government that it was prepared to receive applications for a lease of the exclusive right to mine under certain portions of the farm Turffontein is notable for two reasons. The ground comprises certain 'bewaarpiaatsen' (depositing sites), machine-

stands, and water-rights, the mining rights of which were reserved for disposal by the Government, when the surface-rights were granted. The holders of these rights apparently get no prior consideration in the matter, and it is doubtful whether they will share in the benefits of disposal. The important points in connection with this Turffontein area are that it lies in the richest portion of the Rand, immediately below the Robinson, and that, though small in area, namely, 15.8 claims, it is being offered for public tender instead of being sold at some price agreed upon by negotiation to the adjoining companies, which can work it for the greatest profit. In publishing the terms of the Government's call for tenders, the *South African Mining Journal* refers to the scheme as an "impossible proposition." This is taking too unfavorable a view. Owing to the high value and great reef-widths of the ground, this small block of 15.8 claims could undoubtedly be developed with a new shaft, and, newly equipped, will be worked at a big profit. It would, however, be a most uneconomical undertaking with adjacent mines so well able to deal with the ore through existing shafts and with present mills. To the Robinson Gold Mining Co., the upper claims of the block could be sold for the utmost gain, and to the Crown Mines the lower. Companies which could mine the ore without equipping the ground or sinking a shaft would not be likely to compete wildly with each other for the acquisition of the ground, all the properties in this rich portion of the Rand being under control of Eckstein or the closely allied Consolidated Gold Fields. Perhaps the application for tenders is only formal. It is nevertheless unreasonable, since the Government should give greater consideration to the holders of surface rights or to adjacent companies. The *quid quo pro* will be balanced when the Government has very small blocks of deep-level ground for disposal, which could not possibly be touched by anyone save the companies within or adjoining whose areas these 'fragments' lie. In accordance with the accepted scheme, the Government stipulates that applicants for the Turffontein lease must guarantee a percentage of the working capital, and until flotation must provide evidence of his ability to furnish the necessary funds for the development and equipment of the mine, must float a company within two months of closing the agreement, must create no vendors', promoters', or founders' shares, and must offer 25% of the capital required for subscription to persons resident in the Transvaal.

The Grootvlei Proprietary Mines, Ltd., a subsidiary of the East Rand Mining Estates, has commenced two shafts on the farm Grootvlei, to the north of Nigel in the Far East basin. It may be fairly said that when these shafts cut the reef, and development is commenced, there will be no company on the Rand providing information bearing more vitally upon the industry's future prospects. So far the reef's position in this area has been learned by diamond-drill cores, which, for valuation purposes, are useless in the East Rand, with its erratically distributed gold. Messrs. Lewis and Marks have been a long time in entering upon the critical stage of shaft sinking, but the industry owes them a big debt for their pioneering work with the diamond-drill in the East Rand.

Another record in rapid driving has been established. This has likewise been accomplished in the Far East Rand. During October, two men made a footage of 334 ft. in 62 shifts in a 6 by 7-ft. drift. An average of 12.5 holes per round were put in, and the advance was 5.56 ft. per shift. This was done at the Modder 'B' gold mines. In the adjoining New Modderfontein, 349 ft. were advanced in one month in two drifts worked single shift, while the new Modder 'B' record has been made in a single face, worked double shift. Reckoned solely by progress per shift, the New Modderfontein's record remains unbroken, while the later performance stands first in merit regarding the actual progress of a single face during a month. The most significant conclusion to be drawn from these achievements, in conjunction with those announced by the Van Dyk company, is that the rock of the Far East Rand possesses exceptionally good breaking qualities, and that when any urgent connections have to be made underground at maxi-

mum speed, it is possible to calculate upon monthly footages far in advance of the rates to be safely assumed in Central Rand operations.

Seeing that there was a further loss of 4221 unskilled laborers (including 2157 Chinamen) during September, bringing the total loss for five months to 22,933, the output for the short month was not discreditable. The Transvaal's yield of £2,575,760 was, however, the lowest recorded since February. At the present rate it appears that the total yield for 1909 will be little more than £31,000,000, or one million more than 1908. This aggregate would be considerably below the estimate generally formed six months ago, when the severity of the impending labor shortage was not fully realized, and when 'expansion' was the cry of every mining interest.

The chances of establishing an oil industry in the Orange River Colony have been brought into prominence on several occasions since the war. Up to the present time there has been no market speculation over oil prospecting, although nearly every other mineral product has been given its turn of financial notoriety. It is to be hoped that the Free State Oil Exploration Co., Ltd., now in course of formation, will raise the desired capital to enable it to undertake its drilling program in the Ladybrand district, which has long been regarded as the most promising region. The venture is to be provided with £12,500 working capital, and this amount, judiciously expended, would throw a great deal of light on a question of interest and importance. The report by J. H. Ronaldson, attached to the prospectus, leads one to hope that the proposition will be tackled cautiously. It is a statement of facts from which no wildly sanguine conclusions are deduced. The more or less flat sandstone beds of the Stormberg series (Karoo system) are cut by diabase dikes, in which occluded oil has been found. This is considered to have probably been derived from some source, already containing oil, through which the dike passed. How deep this source may be and how rich in oil remains to be tested. Boring has already been commenced in the district, and a little oil reported at 900 and 1600 ft. Some gas was given off by this bore-hole and also at Harlismith, 140 miles to the northeast.

NEW YORK.

Copper Production for November.—New Copper Combination.—Ely Central.—Stock Market Conditions.

The official report of the Copper Producers' Association for November 1, showing production and consumption of copper in the United States for October, and the stocks on hand at the end of that month, compares with the two previous months as follows:

| | October, Pounds. | September, Pounds. | August, Pounds. |
|-----------------------|---------------------|-----------------------|--------------------|
| Stocks | 151,472,772 | 135,632,565 | 122,596,607 |
| Production | 124,657,709 | 118,023,139 | 120,597,234 |
| Total | 276,130,481 | 253,655,704 | 243,193,841 |
| Domestic deliveries . | 66,339,617 | 52,105,155 | 59,614,207 |
| Exports | 56,261,238 | 50,077,777 | 48,382,704 |
| Total consumption. | 122,620,855 | 102,182,932 | 107,996,911 |
| Stocks remaining ... | 153,509,626 | 151,472,772 | 135,196,930 |

The chief item in the Copper Producers' Association's report is the matter of surplus stock on hand, which shows an increase for the month of 2,036,854 lb., which compares favorably with the September increase of 15,840,207. Exports for October were 56,261,238; domestic deliveries, 66,359,617, the refinery output was 124,657,709 lb. The October output breaks all previous records for production for a single month. The total surplus on hand November 1 was 153,509,626 lb. When it is considered that the total surplus is only a little more than one month's production, that consumption is still running far below normal requirements, the copper surplus ought not to be the weight upon the market that it seems to be. As the matter now stands, practically all of the load is an inheritance from 1908, when the surplus on hand, as on January 1, 1909, was 122,357,260

lb. In view of the fact that the year has been one when production has been breaking records and consumption was far below ordinary requirements the surplus increase of 30,000,000 lb. is not alarming. Ordinarily it would be hardly enough to act as a safe balance wheel for the metal market. The truth is the copper surplus is an inheritance from the days of the 1907 panic, when after a runaway market and ensuing collapse, many mines were compelled to run and keep up production at a loss, because this involved less loss than to shut down and allow machinery to deteriorate and water to accumulate.

The copper combination, which has been the source of much discussion during the past few months, is evidently beginning to take definite shape. Executive officials of some of the companies to be absorbed have stated within the past few days that an agreement has been reached as to the fundamental outlines of the new financial structure. None of the gentlemen interviewed have been willing to allow the use of their names in the matter, but it may be definitely stated that the merger is to include the Amalgamated Copper Co., the Cole-Ryan properties, and the Phelps-Dodge mines, and, perhaps, the Guggenheim properties. William E. Corey, the president of the United States Steel Corporation, and the banking house of J. P. Morgan & Co., are working out the details and some definite public announcement may be expected very shortly. There is no question but the admissions made that such a combination is well under way have already given a much better tone to the metal market. Some large buyers are quoted as being actively in the market for copper at present figures, anticipating an advance.

The more important copper shares in the market have been noticeably stronger during the week, Nevada Consolidated being the leader and selling between \$27 and \$28. Among the cheaper copper stocks, especially the Ely stocks, led by Ely Central, there has been a wild market. The excitement was started by an attack in the columns of the press upon the house which has been carrying on a spectacular advertising campaign, booming the shares of the Ely Central Copper Co. Overnight the shares dropped from above \$4 to a low point of \$1 before the market steadied. It is not thought that the movement in this particular issue can gain headway after the setback it has received and the bitter personal attack made upon some of the operators engaged therein, with regard to one of whom prison records were dug up and published. The market activity in Ely shares has noticeably subsided. It has been, on the whole, rather unfortunate for the market, that shares in these properties should have been made the vehicle of active speculation. The successful mines at Ely are conducted as are immense factory plants, and such startling developments as made the Comstock its place in history, and, later, made Goldfield the centre of excitement, are by the nature of the deposits impossible. Ely properties, when the necessary millions and the equally necessary engineering and metallurgical talent and brains are added, are investments, with great possibilities for appreciation in value, but they are not speculations, such as can justify any such extravagant market movements as have been recently carried on in New York in these shares.

The Goldfield stocks are, seemingly, wholly neglected by the public, the publication of the report of Goldfield Consolidated, which shows it to be earning a moderate surplus over its dividend requirements, had no effect in the way of increasing activity in the shares. Cobalt stocks, although in many cases returning handsome dividends, as in the case of Crown Reserve, which has just declared a dividend of 6%, with an extra disbursement of 9, payable in January, and a cash bonus of 10, which will be distributed December 23, as a Christmas souvenir for the shareholders, are not having much support from the public in the States. A review of the mining markets and mining conditions leads to the conclusion that if the public could be induced to seek mine profits with the same avidity and persistence that it seeks market profits, it would greatly benefit both the public's pocket and the mining industry, though there would undoubtedly be some promoters compelled to seek other fields.

MEXICO.**Milling at Pachuca.—Guerrero Mill. — Hostotipaquillo. — Amparo Mine.—Nazas River Reclamation Project.**

Metallurgical methods in Pachuca, State of Hidalgo, have been revolutionized during the last few years, and anyone wishing to see the patio process at work there will have to hurry. Three large mills are in operation, the Loreto, Guerrero, and San Rafael, and a fourth, the Guadalupe, belonging to the Santa Gertrúdis company, will be in commission soon. These mills all approximate a capacity of 400 tons per day. Coarse or medium coarse crushing is followed by concentration to remove the more easily concentrated material, which happens to result in the removal of the bulk of the cyanicides. The tailing is re-ground to slime, either by single-stage tube-milling or by step-reduction. The resulting slime is agitated with cyanide, followed by vacuum filtration alone, or by decantation and vacuum filtration. Crushing is done in solution in every case, and de-watering and return is also the rule. The ore is first crushed to pass a 2-in. ring in Blake crushers, followed by stamps crushing to 12-mesh, and concentration on Wilfleys. The Wilfleys are also used as classifiers, the slime being sent direct to the Dorr pulp-thickeners. The tailing goes to Dorr classifiers, and the pulp from the Dorr classifiers to tube-mills and return, for which spiral sand-pumps are used. These are practically the only elevators in the mill. From the tube-mill to the Dorr pulp-thickeners the thickened pulp is sent to Pachuca tanks for air-agitation, followed by Moore vacuum-filtration. The solutions go to iron zinc-boxes using zinc shavings, and the precipitate to a small filter-press. The melting is done in crucibles in coke furnaces.

In the Guerrero mill, simplicity has not been considered so much as mechanical efficiency in crushing, and the careful elimination of the cyanicides by step-concentration. The general arrangement is as follows: stamps crushing to 3-mesh; to settling-cones, from which the thick pulp goes to Callow belt-screens; the oversize to Evans-Waddell Chilean mills, and undersize to 3 double-cone hydraulic classifiers; coarse sand to Wilfley tables, medium sand to another set of Wilfley, and fine sand to Johnston concentrators; the slime from the settling-cones and from the 3 hydraulic classifiers goes to a set of Callow de-watering cones, the spigot-product of which goes to Johnston concentrators adjusted for treating slime, and the tailing from these concentrators goes direct to the cyanide plant. The product of the Waddell mills, crushed to 40-mesh, goes to a settling-cone, the slime from which goes to the de-watering cone for the Johnston slime-concentrators, the spigot going to hydraulic classifiers, from which the medium sand goes to the Wilfleys, and the fine sand to the Johnston sand-concentrators. The tailing from the Wilfley tables returns to the Waddell mills; that from the Johnston sand-concentrators to the Dorr separators; the slime from these, crushed to 200-mesh, to the cyanide plant, and the pulp to the tube-mills to be re-ground. The cyanide plant consists of flat tanks with mechanical agitation, followed by decantation of the first and second solutions, succeeded by treatment in a Butters vacuum-filter. The precipitate is dried and shipped to the Loreto mill, which belongs to the same company.

The Marcus Daly interests, holding option on the Cinco Minas group in the Hostotipaquillo district of Jalisco, are now represented by T. A. Ross, who was formerly in charge of the Daly Reduction Co.'s works at Hedley, British Columbia. Mr. Ross is making a final inspection of the development work that has been pushed ahead by H. E. Crawford. A further payment has to be made on the purchase price in January. The total price is ₧530,000. Reference was made some time ago to the increase in depth to be made in the 3-compartment shaft of the Amparo Mining Co. in the Etzatlán district. The contract has been let to C. F. Joyce to sink an additional 300 ft. for \$40, United States currency, per foot, or a total of \$12,000 for the whole extension of the shaft.

Reference was made in a former letter to the Nazas river project, and it has been now decided by the Federal Government that the district is so valuable, agriculturally, as to warrant the expenditure of ₧11,000,000 to build storage

reservoirs for the equalization of the flow of the Nazas river, as by this means the available acreage that can be brought under cultivation will be enormously increased. The project includes the building of two immense reservoirs and a canal to connect the waters of a large lake, with the irrigation system of the Nazas river valley. It seems probable that S. S. Pearson & Sons will get the contract for the whole undertaking. When the project is completed it will give an immense impetus to both agriculture and business.

DENVER, COLORADO.**Cripple Creek.—Boulder Tungsten District.—Georgetown.—Colorado Springs Coal.—State Geological Survey.**

Cripple Creek furnished the usual amount of bullion for the month of October. The production amounted to \$1,291,630. As compared with the figures for September the tonnage increased 470 tons, while the value per ton dropped \$5.81. The production for November will probably be still smaller as the month is short and the snows are beginning to interfere with wagon hauling. Leases granted recently include one on the Empire State shaft and workings, one on the nine claims belonging to the Isabella Mines Co., to the Western Investment Co., of Victor, and the properties of the Republic Gold Mining Co., on Beacon hill, to Sherman Bell. Four mining corporations operating in the district distributed dividends in October amounting to \$154,000. These were the Portland Gold Mining Co., 2c. per share, \$60,000; the Vindicator Consolidated Gold Mining Co., 3c. per share, \$45,000; the Elkton Consolidated Mining & Milling Co., 1½c. per share, \$12,500. The Deep Drainage tunnel advanced 380 ft. during October, making a total of 11,400 ft. from the portal with 3250 ft. yet to go before reaching the main water course. Shippers of low-grade ore to the United States Reduction & Refining Co., at Colorado City, have been notified of a reduction of 50c. per ton on \$10 ore, making the freight and treatment charge \$4 on this ore. The tungsten mines, in the Boulder district, are producing heavily since the rise in the price of the ore, due to the increased steel business. A new tungsten district is being opened near Rollinsville, in the northern part of Gilpin county. Shipments are to be expected in the early spring. The mine operators near Boulder are trying to arrange for a modern cyanide mill at that place to treat the telluride ores of the district. Several important transfers of property in the vicinity of Georgetown have occurred lately. The Bellevue-Hudson and Anamosa group of 14 lode claims situated on Columbian mountain has been sold to Southwestern Mines company, of Boston, for \$63,500. The company has a small force of men working and machinery on the way for shaft-sinking and development work. The Belmont group of nine claims on Saxon mountain has been transferred by the Krupp Mining & Milling Co. to W. L. Mallernee, formerly of Austin, Nevada. The old Dumont mine and mill, near Central City, has been leased by the E. S. James Mining & Milling Co. The lessee is driving an adit to drain the property to a depth of 1000 ft., and is making some repairs to the 10-stamp mill. The high price demanded for an inferior grade of coal by the coal dealers' combine in Colorado Springs, has stimulated competition in the local field. The Colorado Springs Electric Co. has arranged to prospect by drilling its coal lands north of the city with the idea of producing its own fuel. Local men, backed by outside capital, have secured a six months' option on about 5000 acres belonging to the Palmer estate. The land is situated north and east of the city, along the Rock Island railroad, and is within the known coal area.

Back in 1872 the territorial legislature of Colorado created the office of State Geologist. The incumbent was to serve for a period of two years without remuneration of any kind from the State. Although public-spirited geologists of high standing have held the office from time to time, the State has accumulated little in the way of reports. The Sixteenth General Assembly appropriated \$5000 for salaries and expenses, thus, in a slight degree, relieving the State Geologist from his embarrassing position. As a result the first report of the Colorado Geological Survey is at hand.

General Mining News.

ARIZONA.

COCHISE COUNTY.

Two cars of sulphide ore were shipped recently from the Denn-Arizona mine in the Bisbee district to the Copper Queen smelter at Douglas. This is the first shipment for some time, but it is understood that the company is preparing to ship regularly as a large orebody is being opened on the 120-ft. level.—The Arizona & Cleveland Mining Co., owning 13 claims east of Johnson, will resume operations the latter part of this month. A number of assays of ore taken from the property have run from 5 to 78% lead, with 30 to 630 oz. silver per ton.—At the Centurion property the shaft has cut a small body of 30% copper ore and on the 125-ft. level the company is blocking out ore that assays about 5%. J. P. Richardson is manager.—The Keystone Mining Co., at Johnson, has cut some good ore in the shaft and is preparing to install compressing and hoisting machinery.—The Pawnee Mining Co. has been incorporated at Douglas to operate the Claire claims in the Paradise district. Considerable surface work has been done at the property and several shipments of lead-silver made to the smelter.

GILA COUNTY.

Two new Star churn-drills have been ordered by the Warrior Development Co., and will be installed at its property in the Miami district. Both the raise on the 300-ft. intermediate level and the drift have been in high-grade ore during the past week.—The Boston-Miami Development Co. has installed a churn-drill at its property near Miami and will block out the ground in 200-ft. squares.—At the Live Oak mine the west drift on the 200-ft. level is in ore averaging 2¼% copper and the north drift 2½% ore.—A vein of high-grade copper ore was opened on the third level of the Gibson mine at Gibson. The winze, which was started a short time ago on the fifth level, is still in good ore.—Ore assaying \$32 per ton has been opened near the surface of the Duquesne mine, in the Gibson district, and several teams started hauling to the Old Dominion smelter. John F. Shaw is in charge of the work.

GRAHAM COUNTY.

The mill at the Gold Belt in the Morenci district was completed last week and is in operation. A pipe has been laid from the Morenci main to bring the water to the mill, and work has been started on the buildings for the power plant.—The Copper Mines Co. of America has two churn-drills on the property and will have both in operation in a few days.

CALIFORNIA.

BUTTE COUNTY.

The Cherokee Gold Gravel Co. has been organized to reopen the old Spring Valley property at Cherokee and operate it as a drift mine.

CALAVERAS COUNTY.

The cyanide plant at the Sheep Ranch mine, at Sheep Ranch, has been closed down for the winter.—The débris dam of the Cave City company has been completed and the ditches and tail-race are being put in order for the coming hydraulic season.—The shaft at the Clothier mine, near Copperopolis, has been unwatered and will be sunk an additional 200 ft. A new hoist will be erected and considerable development started.—The Duck Bar mine has been closed for the winter.

EL DORADO COUNTY.

The 10-stamp mill at the Mount Pleasant mine, at Grizzly Flat, was started on a lot of ore from the 300-ft. level.—At the Morey mine the mill is running on ore assaying \$100 per ton.—The Noble Metals Recovery Co. has secured a two years' lease on the Golden Cup claims in the Greenwood district.

INYO COUNTY.

The Bishop Creek Gold Co. has completed the installation of a Sullivan 9-drill compressor, and has started drifts on

the vein at the second level at a depth of 288 ft. J. S. Chapman is superintendent.—The water jackets on the furnace at the smelter at Keeler have been replaced by new ones and new buckets and grips are being placed on the tram, the old ones having proved too light. The repairs will be completed about the first part of December, and the smelter blown-in again. A consolidation is being effected between the Four Metals and the Great Western companies.—The shaft at the Union mine is down 1025 ft., and a large amount of zinc ore stored on the dump. The company will store all ore till a spur is completed to the smelter.—An extremely rich discovery has been made at Burgess, a new camp in the Inyo mountains, east of Lone Pine. A 3-ft. vein of high-grade ore has been cut at a depth of 93 ft. causing a rush of prospectors to the district.

MONO COUNTY.

(Special Correspondence).—The Standard Consolidated Co. has decided to lease its holdings, outside of the main workings, and several applications will be granted within a few weeks. Work in the main levels will continue on company account, and it is reported that the installation of powerful electric pumps to unwater the mine below the 600-ft. level will commence early next year. The mill is running steadily on fair-grade ore from the upper levels.—The Douglass company has opened a \$30 shoot of ore on the Mary claim, in the Gold Range district which is said to be over two feet wide. Ten stamps are dropping in the mill.—J. H. McCormick, understood to represent the Broken Hills Mining Co., has closed a deal for the Parret mine, the reputed price being \$300,000. The property is near the May Lundy but has not been developed to any extent. Several small stringers of rich ore and three large veins are said to be uncovered assaying from \$8 to \$300 per ton.—Considerable prospecting is going on in the Mono Lake district and several important discoveries of gold have been recently reported.

Bodie, November 15.

NEVADA COUNTY.

(Special Correspondence).—Considerable work is going on below the 3000-ft. level in the Empire. It is stated that the sinking of the shaft will commence as soon as the running of the big cross-cut near the 3200-ft. level has been completed.—Operations below the 4000-ft. level in the North Star mines are being attended with good results. It is understood that operations at the Massachusetts Hill mine will be resumed next year. The 80-stamp mill is treating ore at a total milling cost of about 80c. per ton.—The 3-compartment shaft at the Brunswick is making slow progress, owing to the hard formation and presence of water. An ejector has been installed and the compressor is about to start. A small force of men is working.—It is reported that sinking will be soon resumed at the Prudential, formerly the New York-Grass Valley. A. P. Wilson is manager.—The San Francisco people who recently took over the Lincoln mine have decided to expend \$10,000 in underground development. The shaft will be deepened and much lateral work undertaken.—Sinking to the 600-ft. level in the Central is progressing, and from this point a long drift will be driven. C. N. Bailey is manager.—It is rumored that operations will shortly be resumed at the Murchie. Part of the indebtedness has been defrayed, and the pumps have been kept in constant action since the suspension of activities.—The Mooney Flat claim is being actively developed.—Sinking at the Kenosha continues steadily. The shaft will be sent to the 800-ft. level. On the 300 and 400-ft. levels milling ore is being opened and occasional bunches of high-grade quartz cut. George W. Root is manager.

Grass Valley, November 17.

A new compressor has been installed at the lower adit at the Gaston mine. In the mill 15 stamps are dropping on ore from the upper levels.—The final payment has been made on the Lincoln mine on Deer creek by John R. Tyrrell and Percy Waters.

PLUMAS COUNTY.

Operations have been temporarily suspended at the Great Divide Mining Co.'s property, in the Indian Valley district.

on account of the shortage of water. The gravel is near the summit of a ridge, all the wash water being pumped from the ravine below. Work will be resumed in the spring with increased pumping facilities.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The new 100-ton leaching plant of the California Gold & Copper Co. is rapidly nearing completion, and it is expected to commence the production of copper within 60 days. Large quantities of oxide and carbonate ore are available in addition to the sulphide reserves opened in the lower levels. Three shafts have been sunk, the deepest being down 325 ft. A. H. Cram is manager.—Promising ore has been intersected on the X-Ray.—The Iron Chief Mining Co. has commenced work on the Eagle Mountain iron deposits. L. S. Barnes is manager.—Considerable work is going on in the tungsten properties in the Clark mountains, 16 miles northwest of Ivanpah. The rocks of the district are principally granite and limestone. The Mount Clark, Hamburg, Jack, Tungstine, and Fitzpatrick, are among the best claims in the district.

San Bernardino, November 15.

SHASTA COUNTY.

The new tramway for the Holt & Gregg quarry, which furnishes limestone for the smelters near Kennett, is nearly completed and will be in operation next week. New tracks are also being laid at the quarries and when completed the output can be raised to 500 tons per day.—It is under-



stood that the Balaklala company is to build a bag-house at its smelter at Coram, but no date has been set for beginning the work.

SIERRA COUNTY.

At the Hunch mine, in the Alleghany district, a new adit is to be started to open the vein at a depth of 200 ft. The former adit cut a 4-ft. vein when in 231 ft., giving 85 ft. of backs.—A lot of high-grade ore from the Sixteen-to-One mine, at Alleghany, was run through the Oustomah mill near Nevada City with excellent results.—The bedrock adit at the Hilda mine, near Sierra City, cut the channel and the owners are doing considerable work to prove its value. The gravel that is now being taken out runs from \$3 to \$12 per car.—The force at the Chipps mine has been increased, and 12 stamps are dropping in the mill.—At the Bullion property a pocket of ore assaying over \$200 per ton was opened.—The Rip Saw mine has been closed down for the winter.—The raise at the Hilo mine, on Chaparral hill, has been completed and the workings are now well ventilated.—Drilling at the Tobacco Flat property has been stopped for the winter. The hole is down 160 ft. in the lava capping.—The gasoline engine has been installed in the mill at the Oakland mine, but the building has not been completed so there will not be much ore crushed this winter.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The past week has been a busy one in the Georgetown district. Numerous mines that

have been lying dormant for a long time are to again receive active development. After a shut-down of over a year a force of 15 men is being employed at the East Griffith, on Griffith mountain. Large development is to follow, as the Griffith Mines Co. is to furnish the heaviest tonnage for the chemical-electric plant in course of construction by the Western Metals Co. W. D. Hoover, of Denver, is manager.—Work was resumed at the Vidler adit in East Argentine, Charles Hall having been awarded a contract for the driving of the bore several hundred feet.—C. E. Pughe, manager for the Linn Consolidated Mining & Milling Co., operating the Mineral Chief mine, on Democrat mountain, has agreed to supply a portion of ore for the chemical-electro plant, adding to the working force.—William M. Cooper, manager for the Capital Mining & Tunnel Co., is constructing an electric line from the United Hydro Power & Electric Co. plant, with which to secure additional power at the 150-ton mill. An addition to the building is in the course of construction. Additional tables have been ordered and it is stated that from 150 to 170 tons of ore will be treated each day.

Georgetown, November 15.

(Special Correspondence).—A contract has been awarded by the Great Northern Mines Co. to drive the 100-ft. adit on the Elm City vein for an extra 100 ft.—A 6-in. streak of ore was intersected on the Bronaber vein last week that assays 1.08 oz. gold. J. T. Mallalieu is manager.—The Tanguay Mining Co. is employing a large force of men at the Josephine mine and shipments of smelting ore have been started. The old Lincoln mill has been overhauled and new machinery purchased. The concentrate so far marketed has exceeded \$25 per ton. J. H. Haynes is in charge.—During the month of October the Central tunnel was driven 96 ft., making the total length 7815 ft. A number of mines are being operated through this bore, the principal of which are the Shafter, Edgar, and Miami.—A pool of local business men has secured control of the Stanley placer and work on a large scale is to be started. A 35-hp. boiler, hoist, and pump have been purchased and are now being placed in position.—A rich find has just been made on the Chicago Belle property at Dumont.

Idaho Springs, November 15.

GILPIN COUNTY.

(Special Correspondence).—A night force has been put on at the Freedom shaft on Winnebago hill, and the workings are being re-timbered and cleaned, preparatory to starting an extensive campaign of development. Large bodies of medium-grade ore are said to be exposed in many of the workings and C. E. Major, the manager, expects to start shipping within from 30 to 60 days.—The Golden Flint mill, at Rollinsville, is running night and day, and during the last week a gold retort of 60 oz. was sent to the Denver mint, the result of one week's clean-up. A carload of concentrate was also sent to the Modern smelter.—A syndicate of Kansas City men has taken a bond and lease on the Susan Mary property, east of Blackhawk.—Denver parties have started work on the Dunn property in the Pine Creek district. The adit has been driven for 295 ft., and drifts run on the vein for 75 ft. New cars and rails have been purchased.—From six to eight carloads of ore are being sent out each day from the Frontenac mine in South Willis gulch, the product being taken from the fifth, sixth, and seventh levels in the west drift. Since breaking into the seventh level, Mr. Lowe, the manager, reports a much better showing. The Frontenac mill, at Blackhawk, is to be enlarged, the capacity to be increased from 75 to 100 tons per day. Card tables will be purchased.—The Aztec Mines Co. is making a number of improvements at the O. K. mine on German hill. A new shaft-house is to be constructed at once and everything placed in condition for enlarged development.

Central City, November 13.

LAKE COUNTY.

Harry Mamlock has resumed work on the Doris property at Leadville, and is repairing the surface plant.—The new Cramer mill will be completed shortly and will treat the ore from the dumps of the Morning Star and Evening Star

mines. Clausen & Buchanan, leasing the Porter shaft of the Morning Star mine, are shipping 500 tons per month.

OURAY COUNTY.

Three carloads of machinery for the smelter that the Mono-Baltic Mining & Smelting Co. is building have arrived and work will be started at once on the plant. Smith McKay will have charge of the work.—A contract has been let to drive a 129-ft. raise at the Commodore Foote property to connect the lower level with a winze that was sunk from the upper adit. The ore in the winze assayed 210 oz. silver and \$7 gold per ton.

TELLER COUNTY.

Cox, Whitmore, and associates, who recently secured a renewal of their lease on the Damon mine, have opened a new orebody on the 100-ft. level, and are shipping to the Cripple Creek mills.—Gold bars were sent to the Denver mint from the Gaylord and Gold Issue mills, approximating \$10,000 gross value. The Billiken Mining Co. has been incorporated to operate in Cripple Creek district, the first property secured being the Specimen mine, on Bull hill, which has been leased from the Stratton estate.—The Anaconda mill, on the Mary McKinney property, has been purchased by Pascal Craig and is being re-modeled to handle the low-grade ores from the properties of the Lexington Gold Mining Co.—The tenth of the month was payday in the Cripple Creek district, and it is estimated that \$350,000 was distributed.—The Doctor-Jack Pot Mining Co. has declared its quarterly dividend of $\frac{1}{2}$ c. per share, payable December 1.—The Humphreys-Thompson Syndicate has secured a lease on the Sheriff mine, on Raven hill, and will re-timber the main shaft to the 100-ft. level.—Twenty-five tons of ore shipped from the Santa Rita mine were settled for on the basis of \$56 per ton.

IDAHO.

KOOTENAI COUNTY.

Four feet of lead-copper ore, with some gold, was cut on the Idaho Copper Mining Co.'s property at Priest lake. The ore was opened by a cross-cut from the shaft at a depth of 75 ft. J. L. Lamphere is in charge of the work.—Shipments of rich copper ore are being sent from the Big Elk mine near St. Joe to the smelter at Tacoma.

OWYHEE COUNTY.

The Banner Mining Co. has added a number of men to its force and the tramway from the mine to the mill is being rapidly completed.—The high-tension line has been connected to the power house at the property of the Silver City Mining & Milling Co., near Silver City, and the plant will be in operation in a few days.

SHOSHONE COUNTY.

Wilbur D. Greenough, president of the Snowstorm Mining Co., operating in the Coeur d'Alene district, announced in Spokane that the company will pay regular monthly dividends of \$22,500.—The Silica Gold & Copper Mining company has been formed at Wallace to work a property situated on the north fork of the St. Joe river, west of the Monitor mine. Three veins have been traced across the ground and three claims are located on each vein.—A 100-ft. cross-cut from the 200-ft. level of the shaft at the property of the Butte & Coeur d'Alene Mining Co. opened a good body of lead-silver ore.—A 100-ton mill is to be constructed for the Black Horse Mining Co. at Paragon, and a tramway built from the mine to the mill.—L. C. Jaquish, who is directing the work on the Mineral Farm group, at Mullan, states that the 5 by 7-ft. cross-cut is in 1420 ft., and that the mineralized zone will probably be reached in less than 100 feet.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The last fortnight has noted the exchange of much mining property in the Joplin district. The Producers Mining Co. has bought the Nancy mine and mill in the Belville camp for a consideration of \$20,000.—In the same camp a Carthage company has purchased 120 acres north of the producing Claycomb land for \$10,000, and will go to work at once.—G. L. Babsen, of

Webb City, has bought a first lease on 10 acres of the Excelsior Lead & Zinc Co.'s land at Four Corners and work will start at once on a 150-ton plant. The price paid was \$20,000.—The Federated Mines & Milling Co. has purchased from the General Zinc & Lead Co. the old Eleven O'clock mine, and a 10-acre lease at Prosperity, the consideration being \$7000.—Among the recent finds reported is one at Duenweg adjoining the McGee silicate property. Lead ore has been discovered from 35 to 55 ft. and a shaft down to 55 ft. is just getting into a blende deposit.—A rich discovery has been made on the Sampson land near Knight's station, four holes now being in ore showing galena from 105 to 120 ft.—Northwest of Carthage a new field has been opened by Steve Chitwood, having drilled through 10 ft. of good silicate on the Wakefield farm. On an adjoining tract a fine run of zinc blende has been opened at 219 ft.—East of Joplin, on the Weyman land, what promises to be one of the best finds for a long time has been opened up by Greninger & Co. The drill first struck ore at 40 ft. continuing to 75. At 94 ft. more galena was found extending to 108, at which level zinc blende was penetrated, and the drill hole was still in ore when it stopped at 119 ft. The ore assays as high as 30%.—Another excellent discovery has been made in Tanyard Hollow at a shallow depth. The ore runs from 15 to 20% zinc and lead. A number of companies are prospecting in that locality.—Two tailing mills are to be erected in the district, one on the Knol ground at Duenweg, which will treat the waste from the old Miami, Millard, Provident, and Egyptian. A second will be built in Jackson Hollow. It will be used as a custom mill and will also treat the tailing from the hand jigs employed in that camp.—Two new mills are promised for the Riseling ground southwest of Joplin, one to be on the old Mandarin tract from which a mill was removed some time ago, and a second to replace the Live Oak which was burned. The latter lease was just getting into splendid ore at the time of the plant's destruction. At both places there are still good workable faces.—A new mill is going up on the Mercantile lease north of Webb City, making the third plant for that company. It will have a capacity of 400 tons. The two mills proved inadequate to treat the ore produced. The company has heretofore been working at the 160-ft. level, but when the plant is completed it will deepen the work to 175 ft. at which point a good sheet face has been discovered.—The Blue Pigeon mine at Tuckahoe is one of the present rich producers of the camp, the ore being cleaned on hand jigs. Much of the ore requires no treatment but occurs in large chunks.

Joplin, November 13.

MONTANA.

MISSOULA COUNTY.

The Monitor Mining Co. is to drive a 5100-ft. lower adit on its property at Saltese. This will open the ore at a depth of 2200 feet.

SILVER BOW COUNTY.

(Special Correspondence).—James H. Reed, of Pittsburg, vice-president and director of the East Butte Copper Mining Co., has been in Butte the past week, engaged in an inspection of the mines and affairs of the company, and at the conclusion of his examination he said the company and the mines were in excellent condition, and for the first time in the history of the company it is earning a good net profit. Since the Pittsmtont mines and smelter have been taken over by the East Butte company, many economies have been introduced, and extensive development carried on in the mines. The company is producing copper at the rate of 7,000,000 lb. per annum and the smelter is run only at half capacity.—The vein on the 1500-ft. level of the Colorado is being opened, which is the lowest level in the mine, but it is the intention of the management to sink the shaft 1800 ft. deep. The assays from the vein on the 1500 give an average of $3\frac{1}{2}$ % copper, and something better than 6 oz. silver per ton, which is about the same as yielded by the ore on the 1400-ft. level. Two new levels will be opened between the 1500 and 1800, which will put the mine into condition for a large production. At present all the mining is being done on the 1400, but a raise has been made from

the 1400 to the 1200 and the opening is all in ore. The company is hoisting about 150 tons of ore per day.

Butte, November 13.

NEVADA.

ESMERALDA COUNTY.

Drifts are following the Victor vein of the C. O. D. Consolidated, and the presence of gray copper is regarded as encouraging. A considerable quantity of shipping ore is exposed in the upper levels of the mine, and further shipments will be made.—The cross-cut at 220 ft. on the Cracker Jack, which is being driven by Mitchell & Fairfield, is nearing the large vein opened above the 100-ft. level.—A hoist will be in operation within a few days on the Thomas lease near the peak of Columbia mountain. Ore of high grade, and carrying free gold, has been found at 115 ft. in the shaft, and a raise will be driven to the shaft from the old company tunnel.—A shipment of high-grade ore was made lately from a lease on the Blue Bull.—William MacKay, who conducted operations on some of the bonanza Mohawk leases, is operating a lease on the Velvet claim of the Merger Mines Co., and has ore blocked.—The Stoneham-Moore-Griffiths lease has a vein of good ore at the 600-ft. level east of the shaft, and is driving for a shoot from the Florence vein.

LANDER COUNTY.

(Special Correspondence).—The Austin Manhattan has cut the Panamint vein in the Frost shaft, 85 ft. below the main adit, and driving to exploit the vein on both sides of the shaft has started. The management announces that the first unit of 10 stamps will be installed within 60 days. The equipment includes a Chilean mill for re-grinding, cone classifiers, Card tables, tube-mill, cyanide tanks, and Merrill filters. C. W. Merrill, of San Francisco, will have charge of the installation. W. W. Wishon is general manager.—The King Midas has struck a strong vein of gold quartz assaying \$40 to \$50 per ton.—It is rumored that the Nevada Equity will erect a mill early next year.—A rich deposit of silver-lead ore has been discovered in the Battle Mountain district.

Austin, November 13.

NYE COUNTY.

(Special Correspondence).—The output of the Round Mountain mill for October amounted to \$41,000. Two ore-bodies, believed to be new veins, have been opened on the 600 and 700-ft. levels. On the 600 the vein is 16 ft. wide, and assays are said to run \$10 to \$15 per ton. It is probable that operations on the eastern portion of the property will soon commence with churn-drills. It is rumored that the directors are considering the declaration of an extra dividend for Christmas. James R. Davis is manager.—The Toquima mill has resumed operations and about 30 tons of ore are treated daily. Within a short time it is expected to handle 50 tons per day. The company has secured a good supply of water.—The owners of the Round Mountain Sphinx and Round Mountain Red Top groups have filed a citation in the district court charging the Round Mountain Mining Co. with extracting ore from properties of plaintiffs.—The Crown Point Globe company, at Johnnie, has decided to install either a 5 or 10-stamp mill. Good results have been secured with the 1-stamp plant, but its capacity is far from sufficient for the ore developed. The company holdings will be patented and a larger pipe-line installed.—The Nevada Johnnie has opened a 4-ft. vein of \$20 ore on the Bullfrog Johnnie. It is reported that this company will install a 5-stamp mill next spring.—The shaft at the Buckeye-Tonopah is down 800 ft., and is passing through rock carrying considerable water. The equipment of the Little Florence at Goldfield has been purchased and will be erected at the Buckeye immediately.

Round Mountain, November 13.

WHITE PINE COUNTY.

The grade from the branch line of the Giroux company's railroad to connect the new shaft with the Nevada Northern tracks will be completed about the first of the year, and coal bunkers and water tanks constructed at an early date. The track will be standard gauge and 90-lb. rail will be used in the construction.—It is reported that the Cole-Ryan interests have secured an option on the controlling interest

of the stock of the Federal Ely company. Deeds have just been placed on file conveying the properties of the Veteran-Ely Extension Mining Co., and the Rickard-Ely Mining Co., to Thomas F. Cole.

OREGON.

GRANT COUNTY.

(Special Correspondence).—The mill at the Cougar mine, three miles from Granite, which is being operated by the National Mining & Leasing Co., has been re-modeled under the direction of Algernon Del Mar, and an all-slime process installed. The ore goes through a jaw-crusher, rolls, and Hardinge conical mill to the agitation tanks. The vein is between 3 and 4 ft. wide, and the average assay of 47 samples was \$17 gold per ton. Theodore L. Lammers is manager.

Granite, November 15.

TEXAS.

BREWSTER COUNTY.

(Special Correspondence).—S. H. Webb, of San Antonio, and associates, are developing a quicksilver claim in the Rosillas mountains, in the southeastern part of the county, and have met with such encouraging results that a 20-ton furnace will be installed. It is stated that the cinnabar ore runs high in quicksilver, and that enough ore is now in sight to keep the proposed furnace in operation for some time. The mine is some distance from Terlingua, which is the centre of the older quicksilver district. Discoveries of rich cinnabar ore are also reported across the Rio Grande, in Mexico, though so far as known but little has been done toward the development of the claims.—A syndicate of Chicago men, headed by C. W. Swenson, have taken the preliminary steps to build a railroad through the heart of the Davis mountains, the proposed line to run from Pecos to either Alpine or Marfa, a distance of about 100 miles. The building of this line will open to development one of the richest mineral regions in the Southwest, according to the report of the State Mineral Survey made a few years ago. The Davis mountains have been exploited very little for precious minerals, owing to their isolation, but a number of good claims have been located and are awaiting the building of a railroad in order to begin development work.

Terlingua, November 12.

EL PASO COUNTY.

A. D. Hudson, of El Paso, is developing a large turquoise deposit in the foothills of the Sierra Diablo, four miles from Van Horn. The country rock in which the turquoise occurs in bunches and seams, also carries more or less gold. It is claimed that this Texas turquoise is equal to that of the best mines in this country.

UTAH.

SALT LAKE COUNTY.

(Special Correspondence).—On Monday of this week the first session of the Salt Lake Stock & Mining Exchange was held in their new quarters, on Exchange Place and Cactus street. The mining temple is a handsome structure, and has been completed at a cost of \$80,000. It is situated in the heart of the new business district of the city, the ground being donated by Samuel Newhouse. The old quarters were occupied by the exchange for 12 years, and during that time the business has grown from a few thousand dollars per month to from \$2,000,000 to \$3,000,000. Seats formerly sold for \$10 and now \$2500 is being paid for the privileges of membership.—Copper production from the Utah mines for the month of October amounted to 9,750,000 lb., being a reduction of almost 1,000,000 lb. from the preceding month. The large Bingham properties mined the usual tonnage, and the loss comes from some of the smaller mines in the outlying districts.—Utah Copper keeps up its splendid production. Its quarterly report, just issued, shows the net profits from mining and milling operations for the September quarter to be \$715,586, and the additional sum of \$6095 from other sources, makes a total net profit of \$721,683. The tonnage milled during the third quarter was greater by about 100 tons per day than for the preceding one. A higher percentage of copper was also recovered which gave a grand total increased production during this period of 1,525,262 lb. The average cost was 8.077c. per lb., as against

9.192c. for the second quarter. Considering the results of the Garfield plant by itself, the cost of net copper production per pound was 7.67c. The cost of mining and milling was reduced 9c. per ton of ore, and the actual cost of milling at the Garfield plant was slightly in excess of 47c. per ton. The cost of mining and expense incident thereto at the mine was 15.39c. per ton.

Salt Lake, November 13.

WASHINGTON.
STEVENS COUNTY.

The Treadwell mine, between Northport and Ione, will begin shipping this fall. The vein was cut at a depth of 252 ft., and assays of picked samples ran from 60 to 80% lead. —Fourteen inches of silver chloride was opened by a surface cut on the property of the International Mining & Milling Co., and a test carload of the ore will be shipped.

CANADA.
BRITISH COLUMBIA.

The ore shipments from the Rossland district for the week ended November 6, and for the year to that date, were as follows:

| | Week. | Year. |
|-----------------------|-------|---------|
| Centre Star group.. | 4220 | 155,133 |
| Le Roi mine | 455 | 8,680 |
| Le Roi No. 2, Ltd.... | 532 | 25,594 |

The Le Roi mine is sending a small tonnage each week to the Consolidated smelter at Trail. This ore is a little better than the average grade of Rossland ore, which is about \$12 to \$14 per ton. Development work is being carried on in the lower levels where the diamond-drills have pierced some good ore, but in small bodies.—At the Le Roi No. 2, Ltd., the main shaft on the Josie property is now down to a point between the 1200 and 1300-ft. levels, and sinking will be continued to the 1300-ft. level before an attempt is made to open the orebodies cut by diamond-drills some months ago.—The ore shipments and ore milled in the Nelson district for the week ended November 6, and for the year to that date were as follows:

| | Week. | Year. |
|------------------------------|-------|--------|
| Blue Bell (milled) | 900 | 43,268 |
| Cork | 22 | 470 |
| Enterprise | 28 | 28 |
| Granite-Poorman | 28 | 294 |
| Granite-Poorman (milled) .. | 250 | 10,418 |
| Kootenay Bell (milled) | 70 | 2,943 |
| Nugget (milled) | 110 | 5,483 |
| North Star | 172 | 1,800 |
| Queen | 30 | 478 |
| Ruth | 120 | 978 |
| St. Eugene | 167 | 17,942 |
| Silver King | 163 | 2,764 |
| Second Relief (milled) | 145 | 6,366 |
| Van-Roi | 20 | 1,095 |
| Whitewater | 59 | 1,244 |
| Whitewater Deep (milled) .. | 700 | 31,600 |
| Yankee Girl | 25 | 1,767 |

The ore shipments from the Phoenix district for the week ended November 6, and for the year to that date, were as follows:

| | Week. | Year. |
|----------------------|--------|---------|
| Granby mines | 25,765 | 853,147 |
| Snowshoe group | 5,710 | 127,714 |
| Mother Lode | 11,264 | 254,028 |
| Oro Denoro | 750 | 5,880 |

A force of 75 men has been put to work by the railway contractors on the new line from Phoenix to Wellington. This crew will shortly be augmented by about 300 men. —The B. C. Copper Co. has a considerable quantity of ore awaiting shipment at its Wellington mines. The B. C. Copper Co. and the New Dominion Copper Co. are gradually

drawing closer together. The president and vice-president of the former have been elected to the directorate of the latter, while A. Lewisohn, a leading figure in the General Development Co., of New York, and a large stockholder in the New Dominion Co., has been given a seat on the B. C. Copper board. Arrangements are to be made for the smelting company to buy New Dominion ore when the mines of the latter start up.

Rossland, November 13.

QUEBEC.

Several veins of asbestos have been opened by a cross-cut on the 400-ft. level of the Black Lake Chrome & Asbestos Co. The cross-cut was being driven through a serpentine formation to explore a deposit of chromic iron ore, and opened the veins, which are about 1½ in. thick, the fibre being remarkably flexible.

MEXICO.
JALISCO.

The 30-ton reduction plant in the Mascota district, constructed by the Lawson Development Co., of which Thomas W. Lawson was the leading figure, is to be dismantled and



Red Mountain, Rossland.

sold. The plant was designed to treat the cinnabar of the district, but custom ores were hard to obtain and the head men of the company refused to raise the money to open the prospects, so the venture has resulted in a failure.

MICHOACAN.

The Anganguero mines of the Michoacan Railway & Mining Co., in Michoacan, have been leased to the A. S. & R. Co., and are now furnishing the main supply of iron sulphide ores coming from the plateau of central Mexico.

OAXACA.

(Special Correspondence).—The Boston-Oaxaca property, El Placer, sold by the receiver recently, was bid in by the minority shareholders. W. S. Mann has gone to Boston to purchase additional machinery.—The new mill of the Rio Seco Mining Co., started on schedule time, and has sent in the first clean-up. The management is entirely satisfied with the results.—Work was started on the erection of a new mill for the Soledad Mining Co., in Totolapam district. It will have ten 1250-lb. stamps, with tube-mill and cyanide annex.—E. M. Lawton has purchased extensive onyx deposits near Etla, and has started developing same. A. G. Hamm is in charge of the work, and a core-drill has been received, with which to thoroughly prospect the property purchased. The Etla onyx is the most popular of all Mexican onyx, on account of its great variety of colors.—The Humboldt Mining Co., of Boston, Massachusetts, has taken over the properties of the Commonwealth Mining Co., in the Taviche district.—The Colonial Mining Co., which has been doing development work on the Sierra Juarez properties, is now about ready to build a mill. The intention is to commence the erection of same this winter. The mill will contain 8 Nissen stamps with tube-mill and cyanide annex.

Oaxaca, November 12.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. A. SCOTT is at Spokane.
C. S. HERZIG is at Ray, Arizona.
A. D. FOOTE is in San Francisco.
BAILEY WILLIS is going to London.
CARL EILERS has been at San Francisco.
R. A. F. PENBOSE, JR., has been at Chicago.
A. G. KIRBY was in San Francisco recently.
HOWARD D. SMITH is in the south of France.
DAVID T. DAY visited San Francisco this week.
GEORGE OTIS SMITH has returned to Washington.
C. M. FASSETT, of Spokane, is on a trip to New York.
GEORGE B. STARR was in San Francisco on his way East.
ARTHUR WINSLOW passed through San Francisco this week.

WALDEMAR LINDGREN has returned to Washington from the West.

O. H. PACKER has returned to San Francisco from Nevada county, California.

WAYLAND H. YOUNG, of Oakland, is on professional business at La Buro, Mexico.

O. B. PERBY passed through San Francisco on his way from Alaska to New York.

REIJI KANDA sailed from San Francisco on the steamer *China* for Tokyo this week.

T. L. LAMMERS, of Spokane, is superintending work at the Cougar mine, near Granite, Oregon.

F. M. FIELD, formerly constructing engineer of the Tonopah Extension mill, has gone to Ogden, Utah.

JOSEPH LANCASTER, of Spokane, is consulting engineer for the Oriole Mining Co., operating at Metaline, Washington.

A. S. HASKELL has established offices as consulting metallurgist and mining engineer in the Foxcroft building, San Francisco.

C. K. LEITH and party have returned from the Hudson Bay region. Some anxiety has been felt over the delay in the return of the party.

JOSEPH A. HOLMES addressed the miners in the anthracite district of Pennsylvania during the week of November 8 on the use of explosives.

C. W. HAYES is a member of the committee appointed by the National Geographic Society to examine the records of the Cook North Pole expedition.

H. G. MORRIS has resigned as superintendent of the Florance mill at Goldfield to accept a position with a New York syndicate operating in California and Mexico.

S. E. BRETHERTON is now in Culiacan, Sinaloa, Mexico, where he went to start a bismuth-lead reduction plant. He expects to return to San Francisco about December 1.

CARLOS W. VAN LAW has resigned as consulting engineer for the American Smelting & Refining Co., and has accepted a similar position with the United States Smelting, Refining & Mining Company.

L. R. BUDROW, formerly manager for the Michoacan Railway & Mining Co., Anganguo, Michoacan, has been appointed manager for the Tigre Mining Co., operating the Lucky Tiger in northern Sonora.

G. S. SIMPSON, vice-president of the Butters Patent Vacuum Filter Co., will hereafter divide his time between the London and New York offices of the company. E. H. GARTHWAITE succeeds Mr. Simpson as vice-president at San Francisco.

Obituary.

E. E. HENDRICK, president of the Hendrick Manufacturing Co., died October 25 at his home at Carbondale, Pennsylvania.

Market Reports.

LOCAL METAL PRICES.

San Francisco, November 18.

| | | | |
|--------------------------|------------|--------------------------|---------|
| Antimony..... | 12-12½c | Quicksilver (flask)..... | 50-51½ |
| Electrolytic Copper..... | 16½-16¾c | Spelter..... | 7½-8¼c |
| Pig Lead..... | 4.65-5.60c | Tin..... | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|-------------|----------------------|-------|----------|-----------------|
| Nov. 4..... | 12.81 | 4.36 | 6.39 | 50½ |
| " 5..... | 12.87 | 4.36 | 6.37 | 50½ |
| " 6..... | 12.87 | 4.36 | 6.37 | 50½ |
| " 7..... | Sunday. No market. | | | |
| " 8..... | 12.87 | 4.36 | 6.37 | 50½ |
| " 9..... | 12.87 | 4.36 | 6.37 | 50½ |
| " 10..... | 12.87 | 4.36 | 6.37 | 50½ |
| " 11..... | 12.87 | 4.36 | 6.37 | 50½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Nov. 11. | Nov. 18. |
|------------------------|---------------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 8 0 ex div. | 1 7 3 |
| El Oro..... | 1 5 9 | 1 5 8 |
| Esperanza..... | 2 18 9 | 2 19 0 |
| Dolores..... | 1 8 9 | 1 8 9 |
| Oroville Dredging..... | 0 11 0 | 0 11 9 |
| Mexico Mines..... | 6 8 1½ | 6 8 9 |
| Tomboy..... | 0 19 4½ | 0 18 9 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| | Closing prices. November 18. | | Closing prices. November 18. |
|-------------------------|------------------------------|---------------------------|------------------------------|
| Amalgamated Copper..... | 95½ | Miami Copper..... | 17½ |
| A. S. & R..... | 101¼ | Mines Co. of America..... | 1½ |
| Boston Copper..... | 16¾ | Montgomery-Shoshone..... | 1½ |
| B. C. Copper Co..... | 7¼ | Nevada Con..... | 29½ |
| Butte Coalition..... | 52¾ | Nevada Utah..... | 1½ |
| Cumberland-Ely..... | 87½ | Newhouse..... | 37½ |
| Davis-Daly..... | 6 | Nipissing..... | 10½ |
| Dolores..... | 7 | Ohio Copper..... | 5¾ |
| El Rayo..... | 2¾ | Ray Central..... | 2¾ |
| Ely Central..... | 1¼ | Ray Con..... | 22½ |
| First National..... | 6¼ | Superior & Pittsburg..... | 17½ |
| Giroux..... | 11¾ | Tenn. Copper..... | 39½ |
| Guanajuato Con..... | 2 | Trinity..... | 11¾ |
| Inspiration..... | 7¼ | Tuolumne Copper..... | 3¾ |
| Kerr Lake..... | 8¾ | United Copper..... | 9 |
| La Rose..... | 4¾ | Utah Copper..... | 58½ |
| Mason Valley..... | 1¾ | Yukon Gold..... | 41¾ |

COPPER SHARES—BOSTON.

| | Closing Prices. November 18. | | Closing Prices. November 18. |
|--------------------------|------------------------------|---------------------------|------------------------------|
| Adventure..... | 5 | Mohawk..... | 63 |
| Allouez..... | 54½ | North Butte..... | 68 |
| Atlantic..... | 12¾ | Old Dominion..... | 54½ |
| Calumet & Arizona..... | 108 | Osceola..... | 169 |
| Calumet & Hecla..... | 670 | Parrot..... | 31 |
| Centennial..... | 89¾ | Santa Fe..... | 17½ |
| Copper Range..... | 88½ | Shannon..... | 16½ |
| Daly-West..... | 9 | Superior & Pittsburg..... | 17½ |
| Franklin..... | 17¾ | Tamarack..... | 67 |
| Granby..... | 104 | Trinity..... | 11¼ |
| Greene-Cananea, ctf..... | 14¾ | Utah Con..... | 46½ |
| Isle Royale..... | 26¾ | Victoria..... | 3¾ |
| La Salle..... | 15¾ | Winona..... | 67½ |
| Mass Copper..... | 6¾ | Wolverine..... | 149 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, November 18.

| | | | |
|---------------------------|-------|----------------------------|-------|
| Atlanta..... | \$ 11 | Midway..... | \$ 17 |
| Belmont..... | 67 | Montana Tonopah..... | 76 |
| Booth..... | 10 | Nevada Hills..... | 75 |
| Columbia Mtn..... | 7 | Ophir (Comstock)..... | 1.40 |
| Combination Fraction..... | 48 | Pittsburg Silver Peak..... | 67 |
| Daisy..... | 7 | Rawhide Coalition..... | 21 |
| Florence..... | 2.45 | Rawhide Queen..... | 23 |
| Goldfield Con..... | 7.37 | Round Mountain..... | 58 |
| Gold Keweenaw..... | 5 | Sandstorm..... | 3 |
| Great Bend..... | 2 | Silver Pick..... | 9 |
| Jim Butler..... | 11 | St. Ives..... | 9 |
| Jumbo Extension..... | 13 | Tonopah Extension..... | 50 |
| MacNamara..... | 29 | Tonopah of Nevada..... | 6.50 |
| Mayflower..... | 9 | West End..... | 23 |

(By courtesy of the San Francisco Stock & Exchange Board.)

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

MINING PARTNERSHIP.

A mining partnership was held to exist between persons who expressly agreed that they would hold and work certain mining claims for their joint use and benefit, and where some work was done on the claim pursuant to such agreement.

Holdt v. Hazard, (Cal.) 102 Pac. 540, Apr. '09.

LOCATION OF MINING CLAIM—QUALIFICATION OF LOCATOR.

Private persons in actions between themselves where the United States is not interested and is not a party, can not question the qualification of a locator of a mining claim, so far as its validity is affected, by reason of his being a foreigner.

Holdt v. Hazard, (Cal.) 102 Pac. 540, Apr. '09.

LOCATION OF MINING CLAIM—ACTUAL POSSESSION.

Where persons make a valid location of a mining claim on the public domain, and in accordance with the United States statutes, their right of possession will continue until they have, in fact, abandoned or forfeited the claim by failure to do the required amount of work within the prescribed time, they are not required to keep an actual possession of the claim.

Holdt v. Hazard, (Cal.) 102 Pac. 540, Apr. '09.

LOCATION OF MINING CLAIMS—MARKING BOUNDARY.

Where notices were duly posted upon each of several mining claims located on the public lands, and which notices designated the place of posting as the starting point, and where they contained calls and distances to certain stakes at the four corners of each claim, the area of which was 600 by 1500 ft., and the stakes thus called for were set, and in some instances stones were piled around them, this was said to be a sufficient marking of the claims.

Holdt v. Hazard, (Cal.) 102 Pac. 540, Apr. '09.

SALE OF MINING CLAIM—TITLE.

A patentee of a mining claim contracted to sell the same to a third person, but on the day thereafter, he executed a deed, absolute in form, conveying the claim to a corporation, without any reference to the contract. Thereafter a third person purchased the claim from the corporation without any knowledge at the time of any equitable claim of such other person arising out of the contract. In an action to settle the title to such claim, it was said that the contract and deed could not be regarded as contemporaneous instruments, because, first, they were not between the same parties, and second, because there was no connection between the rights accruing to the parties, and the purchaser from the corporation acquired title free from any equities arising under the contract.

San Domingo Gold Min. Co. v. Grand Pacific Gold Min. Co., (Cal.) 102 Pac. 548, June '09.

LEASE OF MINERALS—CONSTRUCTION.

A land owner leased to another the right and privilege of prospecting for coal, oil, or other minerals, and the right to dig, excavate, and bore for the same, and to remove them if found in paying quantities. Oil had been discovered in the vicinity, and two wells had been put down on the premises, and the existence of coal was well known. Some of the wells dug produced oil in paying quantities, and the additional compensation was paid and the prospecting was continued for several years, but 15 years after the execution of the lease, the premises were abandoned. No mines were opened for coal, and no use was made of the premises except for the purpose of prospecting and pumping oil. After the premises were conveyed, subject to such lease, in a controversy between the lessee and the grantee, it was held to be a lease for oil, gas, and salt purposes, and not a deed conveying, in fee simple, the minerals under the land.

McMillan v. Titus, (Pa.) 72 Atl. 240, Jan. '09.

Gold, Silver, and Platinum in California in 1908.

The United States Geological Survey reports that in 1908 California produced \$18,761,559 in gold; 1,647,278 oz. of silver, valued at \$873,057; and 706 oz. of refined platinum, valued at \$13,414. This platinum was all produced at placer mines in Butte, Humboldt, Siskiyou, Trinity, Calaveras, Sacramento, and Del Norte counties, three-fourths of it having been mined in Butte county.

California's output of gold, silver, and platinum in 1907 amounted to \$16,727,928, \$751,646, and \$8900, respectively. The quantity of silver mined in the State in 1907 was 1,138,858 oz.; the quantity of platinum mined was 300 oz. The record of the State's production of these metals in 1908 therefore shows considerable gains over the production in 1907. The value of the gold produced in the State in 1905 was slightly in excess of the value for 1908, but with that exception the figures for gold and silver production in 1908 are the largest attained within the last decade. The production of gold and silver by counties is shown in the following table:

| County. | Gold | Silver. | |
|--------------------------|--------------|-----------|-----------|
| | (value). | Fine oz. | Value. |
| Amador | \$1,876,174 | 24,980 | \$13,239 |
| Butte | 3,139,398 | 23,978 | 12,708 |
| Calaveras | 1,378,511 | 118,353 | 62,727 |
| Colusa | 578 | 11 | 6 |
| Del Norte | 3,488 | 36 | 19 |
| Eldorado | 342,033 | 10,385 | 5,504 |
| Fresno | 1,054 | 21 | 11 |
| Humboldt | 33,066 | 613 | 325 |
| Imperial | 5,848 | 232 | 123 |
| Inyo | 308,873 | 58,302 | 30,900 |
| Kern | 827,087 | 182,170 | 96,550 |
| Lassen | 7,284 | 1,477 | 783 |
| Madera | 45,107 | 2,385 | 1,264 |
| Mariposa | 439,862 | 8,928 | 4,732 |
| Merced and Stanislaus... | 182,970 | 2,257 | 1,196 |
| Mono | 413,946 | 49,310 | 26,134 |
| Monterey | 1,318 | 17 | 9 |
| Nevada | 2,297,963 | 41,347 | 21,914 |
| Placer | 358,096 | 4,139 | 2,194 |
| Plumas | 254,737 | 6,717 | 3,560 |
| Riverside | 5,884 | 211 | 112 |
| Sacramento | 1,166,055 | 3,058 | 1,621 |
| San Bernardino | 180,511 | 67,366 | 35,704 |
| San Diego | 6,920 | 162 | 86 |
| Shasta | 1,131,832 | 976,596 | 517,596 |
| Sierra | 412,626 | 3,617 | 1,917 |
| Siskiyou | 504,156 | 11,557 | 6,125 |
| Trinity | 602,944 | 8,055 | 4,269 |
| Tuolumne | 799,752 | 22,136 | 11,732 |
| Yuba | 2,034,486 | 18,862 | 9,997 |
| | \$18,761,559 | 1,647,278 | \$837,057 |

Gains over 1907 in the production of gold were made by 21 counties, chiefly Butte, Calaveras, Inyo, Merced and Stanislaus, Mariposa, Nevada, Sacramento, Shasta, Siskiyou, and Yuba, and gains in the production of both gold and silver were made by 17 counties, among which were Butte, Calaveras, Eldorado, Nevada, Plumas, San Bernardino, Shasta, Siskiyou, Trinity, and Yuba.

Tungsten.

The production of tungsten in the United States, according to the United States Geological Survey, is not large, as a little of it goes a long way for some of its most important uses. Since by far the largest part of the tungsten produced is used in making tool steel, the demand for tungsten decreased greatly during the recent depression in the steel industry. In 1908 the domestic production of tungsten ore, reduced to an equivalent of ore carrying 60% of tungstic trioxide (WO₃) the ordinary commercial basis in the United States, was 671 short tons, valued at \$229,955, as against 1640 tons, valued at \$890,048 in 1907. The statistics at present available from foreign countries show a similar decline.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

ELECTRICITY EXPLAINED. By J. Calvin S. Tompkins. 5 by 7, pp. 64, ill. Cochrane Pub. Co., New York, 1909. Price \$1.

A useful little book which makes some things clear, but in general requires close attention on the part of the non-technical reader.

THE MINERAL INDUSTRY OF TASMANIA. Compiled by W. H. Wallace. Report for the quarter ending June 30. Pp. 16. Tasmania, 1909.

The total value of the mineral output for the quarter was £411,635. The principal items were: blister copper, 2199 tons, £148,544; tin ore, 1132.32 tons, £102,731; silver-lead ore, 20,821.26 tons, £82,790; gold, 12,449.25 oz. fine, £52,881. Dividends for the quarter amounted to £117,441, of which £105,000 came from copper mines.

COMPARATIVE STATISTICS OF LEAD, COPPER, SPELTER, TIN, ALUMINUM, NICKEL, QUICKSILVER, AND SILVER. 15th Ann. Issue. Pp. xxxix and 111. Frankfort on the Main, 1909.

These statistics are now issued jointly by the Metallgesellschaft, the Metallurgischen Gesellschaft A-G, and the Berg- und Metallbank Aktiengesellschaft. The report is distributed in this country by the American Metal Co., Ltd. The tables cover production, consumption, and prices, and are invaluable to all concerned in metal sales or purchase.

MINERAL RESOURCES OF THE PHILIPPINE ISLANDS. By W. D. Smith. Pp. 200., ill. Manila, 1909.

A general account of the distribution and production of minerals in the island, including special papers on the non-metallic minerals by Mr. Smith, the metallic by H. G. Ferguson, who also gives the statistics of production, Philippine raw cement materials by A. J. Cox, the gold-fields of Surigao Peninsula, Mindanao, by Maurice Goodman, and the production of structural material, by G. I. Adams. The report is well illustrated and is exactly the sort of a brief general account that will be most helpful.

COLORADO GEOLOGICAL SURVEY. FIRST REPORT, 1908. By R. D. George. 8vo, pp. 243, ill., index, maps. Denver, 1909.

If this report is a sample of what is to be published, Colorado has done wisely to establish a geological survey, and has fared well in its organization. The volume is not large, but its content is excellent and evidences care in preparation and conscientious field studies. The individual papers in the volume include reports on 'The Main Tungsten Area of Boulder County', by R. D. George and R. D. Crawford; 'The Montezuma Mining District of Summit County', by H. B. Patton; 'The Foothills Formation of Northern Colorado', by Junius Henderson; and 'The Hahns Peak Region, Routt County', by R. D. George and R. D. Crawford.

UNDERGROUND WATER RESOURCES OF CONNECTICUT. By H. E. Gregory, with a study of the OCCURRENCE OF WATER IN CRYSTALLINE ROCKS. By E. E. Ellis. Water Supply Paper, 232, U. S. Geol. Surv. Pp. 200. **SURFACE WATER SUPPLY OF THE UNITED STATES, PT. II., SOUTH ATLANTIC COAST AND EASTERN GULF OF MEXICO.** By M. R. Hall and R. H. Bolster. Water Supply Paper, 242. Pp. 225. **PURIFICATION OF SOME TEXTILE AND OTHER FACTORY WASTES.** By Herman Stabler and G. H. Pratt. Water Supply Paper, 235. Pp. 76.

These reports include a portion of the results of the work of the Water Resources Branch of the United States Geological Survey in the study of the streams and other sources of water supply. The particular group of bulletins illustrates the three sorts of work under way, geological studies of underground water, stream gauging, and studies in water purification.

COMPARATIVE TESTS OF RUN-OF-MINE AND BRIQUETTED COAL ON THE TORPEDO BOAT BIDDLE. By W. T. Ray and Henry Kreisinger. U. S. Geol. Surv., Bull. 403. Pp. 43. **UTILIZATION OF FUEL IN LOCOMOTIVE PRACTICE.** By W. F. M. Goss. Bull. 402. Pp. 28. **COMMERCIAL DEDUCTIONS FROM COM-**

PARISONS OF GASOLINE AND ALCOHOL TESTS ON INTERNAL-COMBUSTION ENGINES. By R. M. Strong. Bull. 392. Pp. 38. **INCIDENTAL PROBLEMS IN GAS-PRODUCER TESTS.** By R. H. Fernald, C. D. Smith, J. K. Clement, and H. A. Grine.

This group of bulletins contains concise statements of some of the results of the work of the Technologic Branch of the U. S. Geological Survey. They will be of great interest and value to all engineers interested in fuel economy.

Catalogues Received.

KEUFFEL & ESSER Co., New York. Pocket Manual of the Engineer's Solar Transit. Illustrated, 54 pages, 4½ by 6½ inches.

STROMBERG-CARLSON TEL. MFG. Co., Rochester. Bulletin No. 1000 (Revised Edition), Mine Telephones. 12 pages, illustrated, 7¾ by 10 inches.

ALLIS-CHALMERS Co., Milwaukee, Wisconsin. Bulletin No. 1618. Fighting Fires with High Pressure Streams. 20 pages, illustrated, 8 by 10½ inches.

MULCONBOY Co., Inc., 723 Arch Street, Philadelphia. Catalogue No. 19, '7-League' Leather Soled Rubber Boots and Shoes. 8 pages, illustrated, 3½ by 6 inches.

THE C. M. FASSETT Co., dealer in assayers' supplies and equipment, at Spokane, Washington, has issued a 200-page catalogue giving descriptions and prices of goods. It contains other valuable data for chemists and assayers.

KEYSTONE PLACER DRILL Co., Beaver Falls, Pennsylvania, 1909 edition of catalogue No. 4, Keystone Cable Drills for Drilling Blast Holes. Contains much valuable information for driller of holes for all purposes. Illustrated, 38 pages, 8½ by 11½ inches.

THE AVERY SCALE Co., North Milwaukee, Wisconsin. Automatic Coal Weighing. An attractive little booklet giving details of these ingenious scales which automatically determine and record net weights. They are particularly applicable to ore and coal. Illustrated, 24 pages 6 by 8½ inches.

WISCONSIN ENGINE Co., Corliss, Wisconsin, Bulletin C-4, Heavy Duty Corliss Engines, Belted type. The company in sending out this bulletin, the first of a series, says: "We have tried to include data of real service to engineers and architects, and think that the data showing the method of estimating the size of a compound engine appear in a catalogue for the first time. The edition is too limited to send out broadcast, to cranks with the catalogue collecting mania, or to the idly curious; but the bulletins will be gladly sent to anyone directly or indirectly interested in power plants and steam engineering." Illustrated, 24 pages, 7¾ by 10 inches.

Elmore Process on Tin Concentrate.

A working trial of the Elmore process on about 35 tons of tin concentrate from South Africa has just been made. The results given below are considered so highly satisfactory that a plant has just been ordered for the mine. The details are as follows:

| | S. %. | Cu. %. | As. %. | Sn. %. |
|-------------------|-------|--------|--------|--------|
| Concentrate | 1.69 | 0.26 | 2.91 | 72.38 |
| Sulphur product . | 20.77 | 2.78 | 33.00 | 3.64 |
| Product | 0.12 | 0.30 | 0.14 | 74.90 |

The loss of tin in the sulphur product amounts to only 6 lb. of tin per ton of material treated, while 95% of the total impurities have been removed. These figures show the process to be capable of such close work as to make it worthy of careful consideration.

Commercial Paragraphs.

The **HARDINGE CONICAL MILL Co.** advises that the directors of the Alaska-Yukon-Pacific Exposition have granted it the highest award given to any fine-grinding device.

WAY'S POCKET SMELTER Co., South Pasadena, California, received an award of a Gold Medal at the Alaska-Yukon-Pacific Exposition for its exhibit of a method of ore testing, as well as for the best and most attractive exhibit.

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TABLE OF CONTENTS.

| | |
|---|-----------------------|
| EDITORIAL: | Page. |
| Notes | 707 |
| The Copper Game..... | 708 |
| Legislation and National Revenue..... | 708 |
| Ely Central and Its Critics..... | 709 |
| ARTICLES: | |
| Copper Deposits of Silverbell, Arizona..... | C. F. Tolman, Jr. 710 |
| Granites..... | Gordon Surr 712 |
| Oliver Continuous Filter..... | A. H. Martin 715 |
| Industrial Accidents and Employers Liability Laws | David Ross 716 |
| Insurance and Mine Accidents..... | G. W. Traer 717 |
| A Nugget which May Have Grown..... | 718 |
| Yakutat Bay Region..... | 719 |
| Fluorspar Grades and Markets..... | F. Julius Fohs 720 |
| A Large Blast..... | 738 |
| DISCUSSION: | |
| Records in Tunnel Driving..... | A. Bement 722 |
| Metal Losses in Copper Slags..... | Lewis T. Wright 722 |
| Ely Central..... | C. S. Herzig 722 |
| Calculation of Blast-Furnace Charges.. | L. S. Austin 723 |
| CONCENTRATES | 724 |
| SPECIAL CORRESPONDENCE | 725 |
| GENERAL MINING NEWS..... | 731 |
| THE PROSPECTOR | 721 |
| DECISIONS RELATING TO MINING..... | 737 |
| DEPARTMENTS: | |
| Personal | 736 |
| Market Reports | 736 |
| Publications Received | 737 |
| Company Reports | 738 |
| Commercial Paragraphs | 738 |

EDITORIAL.

SYMPATHY from the whole world goes out to the families of the miners killed at Cherry, Illinois. The splendid heroism displayed, however, affords inspiration and some consolation.

COPPER development in Arizona is necessitating much railway building. The Southern Pacific is being extended from Courtland to Gleeson, from Tucson to Twin Buttes and Calabasas, from Globe to Miami, and from below Globe to the Copper Hill district. The Phoenix & Eastern is being built from Winkelman up the Gila valley and the Santa Fe and El Paso & Southwestern are both reputed to have additional lines planned. For most of this building, development of copper deposits furnishes the chief motive.

GOLDFIELD Consolidated, according to reports, made at the directors' meeting, November 18, earned \$5,400,000 in net profits during the fiscal year ending October 31. The total dividends declared this year, including the extra for January next, has amounted to \$4,980,662, and it is said that \$1,000,000 will remain in the treasury after these dividends are paid. Certainly the year has been a notable one for this company and Mr. J. H. Mackenzie will turn over to the new manager, Mr. J. R. Finlay, one of the world's great gold mines in excellent condition.

APOLOGIES are not easy to make except in the rare case when another's sins are discussed. All the more credit then when the matter is handsomely done. Some time since *The Financial World* in New York published a bitter attack on the MINING AND SCIENTIFIC PRESS, accusing it of having been in the pay of 'get rich quick promoters'. The editor's attention having been directed to the matter, he found that he had inadvertently named us instead of another mining paper published on the Pacific Coast. In the November 13 issue of *The Financial World* the matter is explained, and regrets expressed for the mistake. The apology is accepted in the spirit in which it is offered. Mistakes will happen in the best regulated editorial office, and stone throwing is an ungrateful occupation at best.

A GENEROUS spirit of 'live and let live' has characterized the negotiations between the Shasta County Farmers' Protective Association and the Mammoth Copper Company. An extremely interesting feature of the adjustment of the difficulties over the smelter fume that has been reached in this instance is the acceptance by both sides of the decree handed down by Judge Marshall, of the United States Circuit Court of the District of Utah. This

has all been accomplished without litigation, but in order to make the settlement definite and binding a friendly action will be brought in the competent California tribunal. The details are being worked out by Messrs T. W. H. Shanahan and Alfred Sutro, the attorneys respectively for the Farmers' Association, and for the Mammoth Copper Company. The company will accordingly complete a bag-house similar to that installed by the United States Smelting, Mining & Refining Company, at Bingham Junction, Utah, and neutralization of the sulphuric anhydride by zinc oxide will be undertaken. Another point in connection with the Utah decree, which is a part of the agreement reached in Shasta county, is that the gases issuing into the atmosphere from the bag-house flue shall not carry more than three-quarters of one per cent by volume of sulphur dioxide.

It is a matter of great interest to note that the method of neutralizing smelter fume with zinc oxide has been brought to such a state of perfection that it may be accepted as a competent solution of the problem. Whether it is subject to limitations which will prevent its becoming standard practice will appear when a description of the details is made available.

The Copper Game.

Quite the most sensible thing announced in regard to the proposed combination of the copper producers is that manufacturers will consume as much of the metal at 16 cents with assured stability of price as at 13 cents under the present conditions of an unstable market. The difficulty is to find a means for stabilizing the price without flying in the face of the Sherman Act. Combinations in restraint of trade may sometimes work a benefit, but the judgment of the world has been that commercial instruments capable of reducing economic waste too often prove destructive of individual opportunity. Rumors that the combination had been effected have been followed by denials, and public anticipation alternately has been raised and depressed. All this has been favorable to stock speculation by those who really knew the progress of the negotiations. Copper shares have gone to a high figure and now are again down. Thus the insiders have been in a position to gain from the mere anticipation of a merger, which if accomplished would probably have resulted in unloading inflated stock upon the public. The other day it was positively stated that Phelps, Dodge & Company would not enter into any combination. Thus the most alluring item was erased from the program. The Guggenheims have always stood ready to win by selling stock on the rise and metal at prices unknown to competitors, and being frequently in a position to do both, there is no wonder that a sphinx has sat by the door of J. P. Morgan & Company, the Guggenheim bankers. The latest news is that the copper magnates fear to undertake a combination until the bearing of the recent decision against the Standard Oil Company is determined. In short, the copper situation is approximately what it was six weeks ago, with no prospect of sudden change, but meanwhile the shearers on Wall Street are busy at the old trade.

Legislation and National Revenue.

Congress will be again in session soon and a general feeling exists that constructive legislation of unusual importance may be expected. It would be well if this should prove true. The mining industry has many needs, and mining men are interested in many matters that are sure to be up for action. The reform of the land laws, the support of the Geological Survey, the creation of a Bureau of Mines—these are a few. There is a feeling, too, that the time has come, if not for less talk, at least for greater performance regarding conservation. Something will likely be done; how much, depends on many factors, including the state of the public purse and the number of other demands which Congress will have to face. It should be remembered that the majority of the proposed changes require an appropriation of some sort to make them effective. Even where, as in the Forest work, the final result will be to produce revenue, the immediate effect is the reverse.

Last summer in defending himself against the charge of not having properly supported the conservation policies of Mr. Roosevelt, Mr. James A. Tawney, chairman of the House Committee on Appropriations, pointed out that we are now spending 41 per cent of our national revenue aside from postal receipts, for the army, the navy, and for fortifications; and an additional 31 per cent on account of past wars, principally in providing pensions. In other words, here in a time of peace, 72 per cent of our national revenue goes to meet war expenses, and only 28 per cent is available for all other purposes. How can we ask that additional expense be incurred for even the most useful peace purpose, unless we are willing that the war expense be cut down? It is unfair to ask the impossible of Congress.

The Federal Government has been spending money liberally and with general consent, on pensions, the army, and the navy. These expenditures must in large part continue. In addition, pressure will be brought to bear this winter to enact a law in aid of a merchant marine; perhaps partly as an auxiliary navy. Is all this necessary, and if so, is the money being economically expended? We believe it would be well to look into this thoroughly before increasing any of the war expenditures.

As to pensions, one need only visit the House at Washington on one of the evenings when such bills are considered, to discover that private pension bills are passed by hundreds with no public discussion and apparently with no consideration. Presumably they have been considered in committee, but observing the number, and knowing something of the activity of the ordinary Congressman, we have no hesitation in saying that such consideration must have been merely formal. If any one doubt this let him recall the cases of pensions which have come within his own experience; such perhaps as the leading merchant of his own town, thoroughly capable of transacting business, and in no way dependent, who may be drawing the largest pension in the village; or, possibly, a State officer, a man of private means, who is neither disabled nor dependent, and yet remains on the pension roll to the day of his death. Even

millionaires, owners of railways and mines, Governors of States, draw pensions. These are just a few cases. They indicate a distressing and wide spread moral weakness. No one has any objection to the payment of liberal pensions to needy ex-soldiers and sailors, but the plain truth is that the country went pension-mad some years ago, and the system has come to be used for political purposes.

Something may also be said as to economy in army and navy circles. The public thoroughly understands that these branches of the public service must be given latitude in making expenditures, but it requires little contact with the army, at least, to show that this latitude is abused. Furthermore, it is not generally known, yet none the less true, that the Treasury Department requires from army and navy officers less detailed statements, and less in the shape of vouchers than from men in the other departments. There is not the careful and intelligent consideration of small expenditures in these services that ought to exist.

Finally the question forces itself forward as to how economical Congress itself is. It will be sufficient to cite a single case. Last year at the time when Mr. Roosevelt was in controversy with Congress over matters relating to the secret service, Mr. J. R. Garfield, then Secretary of the Interior, made certain statements supporting the Congressmen rather than the President. Observe the result, \$1,000,000 is promptly voted to the Secretary for the prosecution of land frauds in his Department. The previous appropriation had been \$400,000, and while the Secretary had asked for an increase it was entirely clear to everyone familiar with the situation that the large appropriation came quite as much as a reward of merit as because of the needs of the case. A good many Congressmen were angry last February, and, human nature being as it is, it is not surprising that personal feelings entered into some of the legislation of the closing days. Congress is not economical nor do many of the members work hard enough to have any real comprehension of the business side of the Government. A well informed and candid Congressman, in private life the director of large enterprises, estimated that the most hard-working men on the appropriations and other big committees put in about sixty days in the year on the real work of the Government as distinguished from politics and personal service to constituents. Those on other committees put in not more than five or ten days of similar work. If the Nation is to have a real business administration at Washington it is evident that these conditions must be changed, and it ought also to be clear that we who are away from Washington must give consideration to means as well as to ends if we are to effectively campaign for legislation requiring expenditure. It is a weak position to demand of Congress additional things, and then not to be prepared to support Congressmen in cutting off something else to grant the requests made. Nevertheless this country is rich enough to meet every legitimate expenditure, and provided the money be properly spent, the country will support as large appropriations as may be needed for public works and conservation.

Ely Central and Its Critics.

Our New York contemporary, *The Engineering & Mining Journal*, has recently severely criticised the methods used in promoting the Ely Central Copper Company. In this it has our entire sympathy. Readers of our own New York letters will remember constant warnings to the effect that the stock was being systematically boosted to an unwarranted height. This, in itself, would not be worthy of much comment since many better known and intrinsically valuable copper stocks, such for example, as Amalgamated and Nevada Consolidated, are now selling at prices out of all harmony with the security back of them, and the dividends paid, as compared, for example, with high-class bonds. The truth is that copper stocks, in particular, are selling now at inflated prices to people who buy with an eye rather than hoped-for future unloading prices than to ore reserves or earning capacity. Much of this is due to the gambling spirit of the ordinary buyer. Some is due to manipulation from the inside; as bad, even if more adroit, as that charged to the Ely Central. We seldom undertake to analyze the price at which mining stocks sell, for the reason, as stated, that the selling price under usual conditions bears no fixed relation to the value back of the stock. As to Ely Central, the property is clearly in an unproved stage, and the business organization is as certainly not one which warrants the public in buying the stock except as one might bet on a roulette wheel. All this is and has been clear from the first to any intelligent reader of the advertisements which have been scattered broadcast through the country. It will take, however, more than one such exposure to change the common buyer's attitude toward such stock. While we approve of the work done by *The Engineering & Mining Journal*, we may also suggest that there are more worlds to conquer and bigger boys to lick.

Incidentally the controversy has brought out some interesting points regarding the genesis of the Ely deposits which are worthy of careful study. In another column Mr. C. S. Herzig, who needs no introduction to our readers, presents some data regarding the Ely Central which put the matter of finding ore under the rhyolite in a much more hopeful light. If the secondary enrichment of the deposits took place before the rhyolite outflowed, there is no reason why the monzonite under the present capping may not be found to be valuable; which, it hardly seems necessary to add, is by no means saying that it will be so found. The question, too, of the possible value of deposits in the limestone cannot be summarily dismissed. Indeed, in accordance with observations elsewhere, the limestone would seem extremely likely to contain orebodies. We are glad to know that the United States Geological Survey has been investigating the Ely deposits. Mr. Arthur C. Spencer, the geologist in charge, is well qualified to pass on the subject, and his report will be awaited with much interest. Mr. A. C. Lawson's work in the camp in its early stages of re-juvenation was fundamental, but it is none the less possible that Mr. Spencer may find proper ground for difference of opinion in some particulars.

COPPER DEPOSITS OF SILVERBELL, ARIZONA.

Written for the MINING AND SCIENTIFIC PRESS
By C. F. TOLMAN, JR.

Silverbell is situated about 35 miles slightly north of west from Tucson, Arizona, and is connected with the Southern Pacific railroad by a branch at Red Rock. Formal work was started in 1902 by the Imperial Copper Co., although previous to this time a number of attempts had been made to work the mines, all of which ended in failure or only half success. The product of the mines is handled at the Sasco smelter, which is already an important copper producer, the monthly product averaging about 1,000,000 lb. of copper. Almost nothing has been written about the geology and ore deposits of this region, and as they present a number of novel points, and as the district promises to become an important copper centre, I will endeavor to present the salient features in a sketchy manner. Accurate maps and data could hardly be presented without the consent of all concerned, and therefore all figures are to be considered as diagrams, representing the structure only in a general way.

Geology.—The district presents fragments of the Paleozoic series, an alaskite porphyry intrusion, and many later andesite and trachyte porphyry dikes. The covering formations of no interest economically are rhyolite, andesite, tuff, detrital sand and conglomerate, and recent basaltic flows. The shattered limestone blocks, floated up on the alaskite porphyry, do not furnish the data necessary for compilation of the geological column. In the adjoining Silver Hill mountains 3700 ft. of alternating quartzites, shaly quartzites and limestones, and massive limestones, are exposed. These show Carboniferous fossils in the massive limestone, and no fossils have been found in the quartzites and shaly quartzites. There is no exposure here of the underlying Pinal schist which

rhyolite porphyry, belonging, therefore, to the family of rock known as alaskite. The igneous rock is in

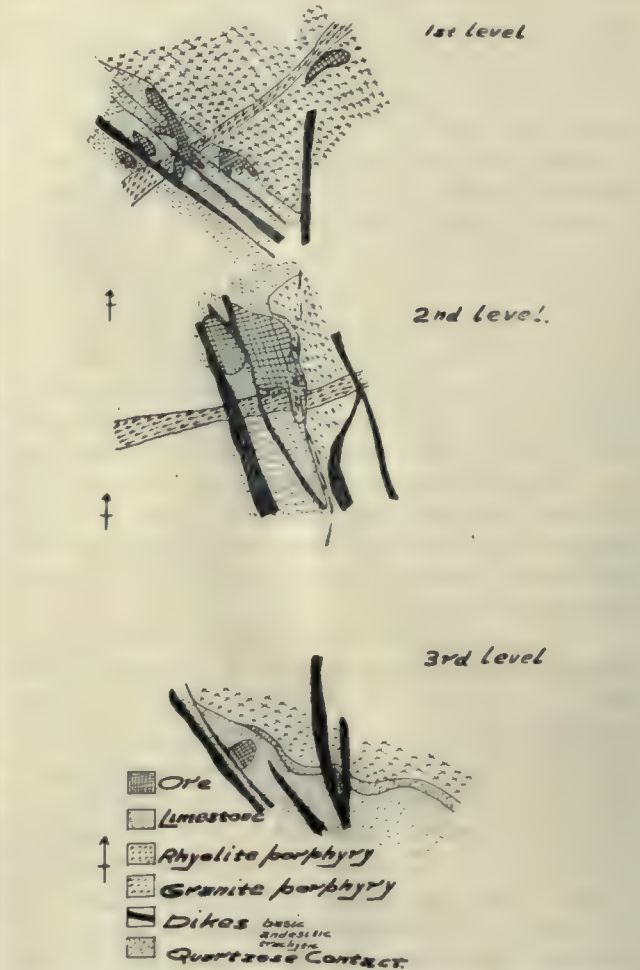


Fig. 2. Sketch Showing Geology of Portion of Three Levels of the Mammoth Mine, Silverbell.

much greater bulk than the sedimentaries, and fills the space between them in an irregular manner. The rhyolite porphyry predominates, and kaolinizes

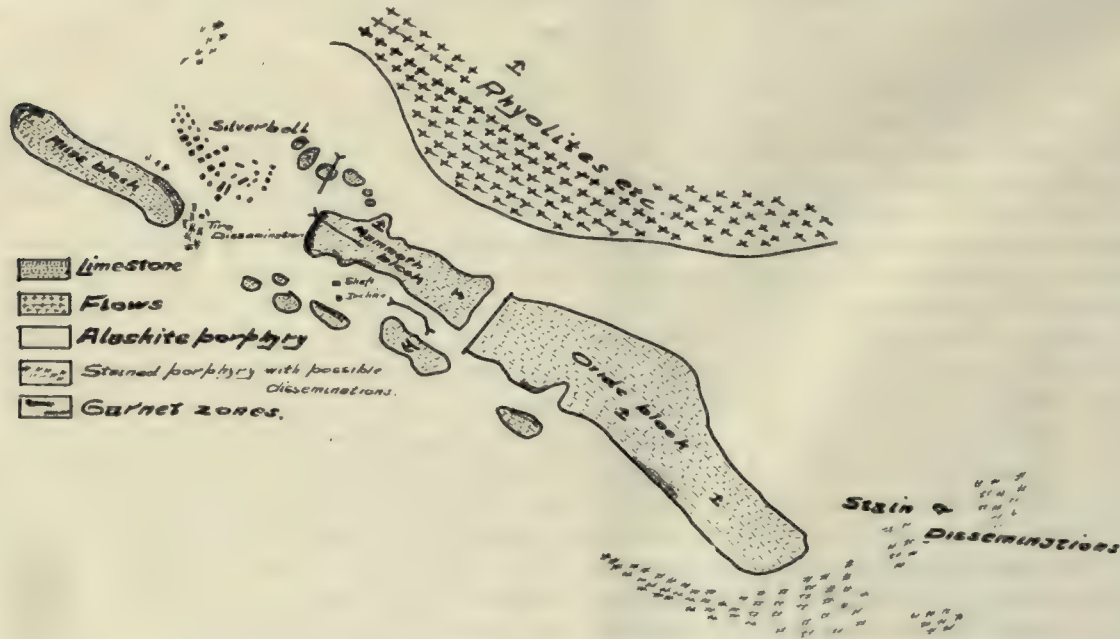


Fig. 1. Sketch of the Geology of the Vicinity of Silverbell.

is found in many of the fault-block mountains west of Tucson.

The Intrusion.—This is a very acid granite and readily, as it is very porous to the downward percolating waters. The coarser granite porphyry occurs in zones and lenses in the rhyolite porphyry,

and occasionally in distinctly later dikes. Detailed geological work may possibly show a genetic relation between this intrusion and the extensive rhyolite flows to the north. The sketch attached (Fig. 1) will give a graphic notion of the relation of the lime blocks to the intrusion. Very heavy contact zones develop along some of the contacts. Garnet, magnetite, specularite, quartz, epidote, copper-bearing pyrite, and chalcopyrite, are the most important of the minerals developed. At certain contacts, especially where the porphyry extends between the shattered blocks, quartzite develops, which in places is a very acid phase of the porphyry, and again may be a silicification of the limestone (Fig. 1).

The Orebodies.—Several types of orebodies occur:

and silver are found in the Silver Hill mountains. All this is in accord with the general law that the silver-lead deposits are formed farther from the intrusion than the copper ores.

The Imperial orebodies.—There are two types of contact orebodies worked by the Imperial company. The Mammoth orebodies are smaller irregular lenses of high-grade chalcopyrite ore, while the Union-Billy ore-zone furnished large copper-bearing pyrite orebodies of the more normal type. The former occur along a branch dike of the rhyolite-porphyry in the limestone. The sketch of a small portion of the first, second, and third levels, adapted from the mine maps, indicate something of the irregular shape of the ore-lenses, and the relation of these bodies to the main contact (Fig. 2). These sketches must not be



Mammoth and Incline Shafts, Imperial Copper Co., Looking North. Hills in Background Capped With Massive Garnet-Iron Formation; Branch Dike Passes Through Gap on Left.



Union and Billy Shafts, Imperial Copper Co., Looking South. Lies North of Garnetized Limestones. Massive Hill in Distance on Right is Garnetized Limestone Cut by Rhyolite Porphyry. Billy Shaft on Left.

(1) Contact bodies in limestone. These have been worked in the old Atlas mine. They are producing most of the ore of the district in the Imperial holdings. They are evidenced by heavy garnet caps in the Oxide's properties, but have received scant attention here as yet. (2) Disseminations. These have undergone some preliminary prospecting by the Tiro and the Oxide companies, and more recently by the Imperial Copper Co. Local mining men are testing leached stained porphyries southeast of the Oxide Copper Co.'s properties. (3) Fissure veins in the porphyry. These are of scientific interest only. (4) Fissure veins at some distance from the porphyry. Veins in the rhyolite two miles north of Silverbell have furnished some rich lead-silver-gold ore. Strong fault-fissure veins containing copper, lead,

taken to indicate disappearance of the ore, for the fourth level has produced many times the ore of the upper levels, and general improvement in depth is marked. The numerous dikes, some of which are shown in the sketch, seem to bear no genetic relation to the ore, some of them being later than and cutting the orebodies. A well defined fissure follows the general trend of the contact, and goes by the name of the 'Mother Fault'. It does not show much movement, and is probably one of the later features of the deformation of the region. It has been thought to have some effect on the distribution of the ore, but this relation is far from demonstrated. It may be said that the chalcopyrite orebodies form outward from the rhyolite-porphyry on the hanging wall of the ore-zone, down into the lime. When the limits of

one orebody have been defined the procedure is to cut back to the porphyry and explore the contact until another lens or stringer is found leading into the lime, which of course is followed and developed. The lenses consist of chalcopyrite, pyrite, quartz, molybdenite, and occasionally wulfenite. The ore is undoubtedly original, no sign of secondary enrichment showing, and therefore making an interesting case of primary ore of commercial value. North of the Mammoth ore-zone, the Union and Billy shafts have developed large orebodies. The copper minerals are copper-bearing pyrite with some chalcocite and chalcopyrite. Associated, especially as caps above the ore-shoots, are the contact minerals. Some of the contact zones are so dense that almost no alteration is noticed even at the surface, and without any subsequent enrichment they carry sufficient copper to be mined as ore. Recently the Imperial Copper Co. has been pushing developments of the copper-bearing porphyry. Mr. Staunton, writing of the possibilities of these disseminated ores, states: "We think the probabilities very great in this way, especially north and east of Silverbell, and are beginning extensive prospecting of this ground by both drill and shaft, with results that are already encouraging."

At the Tiro development has been confined to opening a disseminated chalcocite orebody in the porphyry. Where first struck this orebody furnished remarkably high-grade ore, shipments containing 20% copper being reported. The ore is in a brecciated and leached porphyry, the copper occurring as disseminated specks in the rock, and also as veinlets, filling the fractures of the breccia-zone. In rock reported to assay as low as $1\frac{1}{2}\%$ the disseminated specks of chalcocite can scarcely be noted by the naked eye, while 4% ore shows both disseminations and veinlets. The upper portion of the orebody is now undergoing oxidation and downward migration, and here the oxidized products, cuprite and melanconite, are in evidence. The surface outcrop of this orebody is a brecciated silicified zone, showing copper silicate and carbonate stains.

Other disseminated deposits.—Throughout the southeastern portion of the belt, especially in the holdings of the Oxide Copper Co., locally better known as 'the Young America property', are extensive areas of iron-stained porphyry, stained also in places by salts of copper. The porphyry is alternately kaolinized and silicified. The ore mined by the early prospectors was from a brecciated zone, very silicious, containing native copper. This ore has been mined for converter-lining in a small way. In some of the tunnels of the Tiro company the disseminated chalcocite zone has been reached.

Veins in the porphyry.—A fine example of this group is found southeast of the Mammoth shaft. These are interesting on account of the minerals shown, which are quartz, fluorite, molybdenite, and chalcopyrite. These veins are of the same date as the general mineralization of the porphyry, a mineralization of course of no economic importance except as the products have been secondarily concentrated with disseminated deposits by descending surface-waters.

GRANITES.

Written for the MINING AND SCIENTIFIC PRESS
By GORDON SURE.

Granites were formerly considered by many to result from the burying and subsequent re-crystallization of sediments, but this view has been generally abandoned, owing to increasing knowledge, and granites are now regarded as generally true igneous rocks, which have been forced from below, while molten, into the outer crust of the earth. Some smaller bodies, being offshoots which were intruded between stratified rocks, are often found to rest upon rocks other than granite, but the thickness of the large granitic masses, such as form the cores of mountain ranges, is unknown. While erosion in some regions has carried away the granite to depths which can be expressed in miles, no bottom to the larger masses has been revealed. Were granite of sedimentary origin, surely some trace of the original floor would be discovered at times. The great thickness of the granite masses, with their uniformity in composition, is alone sufficient to point to an igneous derivation, to say nothing of the evidence furnished by other facts observed in the field, and by the differing chemical analyses of granites and sedimentary rocks.

Granitic rocks are deep-seated, and are only naturally exposed through the removal of the beds which once overlaid them. It is reasonable to suppose, both that many granite areas have not yet seen the light of day, and that others once exposed are now buried beneath sediments. In the light of these probabilities and the known abundance and unknown thickness of granitic rocks, it is clear that their volume must not only be immense, but, like the famous caverns in Xanadu, 'measureless to man'. Volcanic rocks cover thousands of square miles of the earth's surface, but, their thickness being limited, their total amount is probably small compared to that of granitic rocks.

Granite gets its name from the Latin *granum*, meaning a grain, on account of its granular texture, and mainly consists of alkali feldspar, quartz, and small amounts of either mica, hornblende, augite, or other minerals, one or more of which may be present. Generally the feldspar is chiefly a potash variety, either orthoclase or microcline, but, in some granites, the principal feldspar may be albite, which is a soda feldspar, or anorthoclase, a potash and soda variety. Granites, however, are usually classified according to the relative abundance of the minor constituents, giving rise to such terms as muscovite-granite, biotite-granite, hornblende-granite, augite-granite, tourmaline-granite, and others. The chief minerals in ordinary granite are feldspar, quartz, and mica, the first being mainly potash feldspar. Most granites contain not only alkali feldspars, but also small amounts of soda-lime feldspars, which latter may often be distinguished by the fine parallel lines upon them, seen with or without a lens. When these two kinds of feldspar are present in approximately equal quantities, the rock is known as quartz-monzonite. When the soda-lime feldspars are greatly in excess, or the alkali varieties are absent, or nearly

so, the rock becomes quartz-diorite, hence, quartz-monzonite stands between granite and quartz-diorite. Little true progress can be made in the study of rocks until it is realized that they grade into one another, hard and fast lines between them being purely imaginary.

Syenite may be defined as a granite containing little or no quartz, and with increasing amounts of soda-lime feldspars it passes through monzonite into diorite; it is a rare rock, the 'syenite' of the miner being generally something else. The name is from the ancient Syene, in Egypt, now called Assuan, and here the Egyptians opened great quarries from which came the obelisks in New York and London. The Assuan rock, however, is a granite containing mica, and also hornblende in portions of it, and it is noteworthy that these obelisks have sustained more injury from exposure for a few years to the climates of New York and London than they suffered during over three thousand years in Egypt. Gneiss, unless qualified by some prefix, has the same constituents as

and may be absent in both aplites and pegmatites. Quarrymen and stone workers term various rocks granite, 'black granite', for example, including gabbro, diabase, and diorite.

As is well known, the color of granite varies, and although the other minerals have some influence, the general color of the rock almost invariably depends upon that of the feldspars. A red or pink color is thought to be due to the presence of extremely small particles of hematite in the feldspars, while minute crystals of epidote and scales of chlorite give rise to greenish tints. When red or pink feldspar, and that of another color are observed in the same granite, the former is almost certain to be a potash variety.

Rhyolite is the volcanic equivalent of granite, and in like manner latite bears the same relation to monzonite, trachyte to syenite, phonolite to nepheline-syenite, dacite to quartz-diorite, and andesite to diorite. That granite was formed under pressure is indicated by the presence of liquid carbonic acid in some of the small cavities in the quartz of granites,

for this gas can only be liquefied by pressure, and it is further evidenced by the granite minerals themselves, which seem to have crystallized out, not from a simple dry fusion, but from material containing superheated water and often other substances, some of which, being volatile under the conditions, would have more or less escaped had they not been confined. The relations to each other of the minerals in rocks show the sequence in which they must have formed, and in granites the mica and hornblende have generally crystallized first, then the feldspar, and lastly the quartz, and yet quartz is far more infusible than feldspar; the successive crystallizations, be it, said, are likely



Weathered Granite Surface. Showing Boulder Forms.

ordinary granite, but they are arranged roughly in bands, although, unlike a schist, the rock does not split readily. The names 'granulite' and 'binary granite' have been applied to granites containing little or no mica, hornblende, etc., but the former having been employed in a restricted sense, and the latter being awkward, J. E. Spurr has proposed the term 'alaskite' for granular quartz-feldspar rocks of this kind, a name, be it said, which seems as good as any other. Pegmatite is a coarse-grained granite, occurring as dikes, veins, and irregular masses, being usually more silicious than ordinary granite, sometimes in fact grading into quartz veins. The principal minerals, while the same as in granites, vary in their proportions. Pegmatites seem often to have been formed during the last stages of the cooling of granite masses, when water and silica were abundant in the material from which they crystallized, and it is interesting to note that many elements present in granites only in very small amounts are sometimes concentrated in pegmatites. In the variety of pegmatite called 'graphic granite', the quartz and feldspar evidently crystallized at about the same time. Aplitite is a fine-grained granite, much finer in grain than ordinary granite, and like pegmatite is generally higher in silica than granite, and usually occurs as dikes and veins. Mica is deficient in aplites

to overlap, thus causing the growing minerals to interfere with one another to some extent. Again, quartz and alkali feldspars have never been artificially made by the cooling of dry melts in spite of numerous attempts, but they have been so prepared in the presence of water under pressure. The white mica, muscovite, has not as yet been found as a primary mineral, save in deep-seated rocks, especially granites, and as it contains water and when heated fuses to a glass, it manifestly did not crystallize from a dry fusion. Muscovite also contains fluorine, the best developed specimens being seemingly those richest in this element, and it is interesting to note that in making any mineral artificially, compounds of fluorine, boron, and other elements, frequently present in granites, greatly facilitate crystallization, although water is probably of the greatest importance.

Without going into more details it seems that granitic rocks result from the slow cooling and crystallization of heated material under pressure, containing water and often other bodies which promote crystallization, and that solidification takes place at a temperature no higher than a dull red heat, for granites contain minerals which lose some of their physical properties above that temperature. Thus, strange as it may appear, the crystallization evidently occurs at a temperature considerably be-

low the fusing points of most of the granite minerals, the material undoubtedly remaining liquid chiefly on account of the presence of water. Aplite is often found in minute cracks and openings in rocks, indicating not only that the matter must once have been very liquid, or possibly even gaseous, but that pressure was required to force it into these small spaces, and estimates have been made of both temperature and pressure by measuring the amount of contraction of the fluids sometimes seen partly occupying small cavities in the quartz of granites. Obviously, when the molten matter which subsequently cools as granite is forced into overlying rocks the latter must be of sufficient thickness to prevent rapid cooling, and must be strong enough to resist the pressure from below, otherwise the liquid material would be poured out on the surface. It therefore follows that granites and all deep-seated rocks have solidified, not only under the pressure from below, but also under that exerted by the weight of the overlying rocks, and consequently granites are naturally exposed only through the removal by erosion of the formations which once overlaid them.

When the pressures and strains accompanying intrusions of igneous rocks are considered, it is small wonder that in some localities granite is still under a compressive strain, which is shown not only by vertical drill-holes becoming partly closed and by the crushing of cores between adjacent holes, but also by the sudden formation of fissures in quarries. T. Nelson Dale states that, owing to the strain, a sheet of granite was actually extended 5 ft. in a quarry at Concord, New Hampshire,* and in some quarries the granite, when split in large sheets, breaks with an explosive sound; the openings made in quarrying, of course, give rocks under strain opportunities to adjust themselves. The granites of some of the Eastern States are ably described by Mr. Dale in Bulletins 313 and 354 of the United States Geological Survey.

Granite seems almost always to be divided into sheets, by fractures which are roughly parallel to the present surface, these sheets increasing in thickness with depth, and it is probable that this structure is mainly owing to compressive strains, although the thin sheets at and near the surface may have been partly formed through expansion caused by the heat of the sun. The relief of pressure due to the removal, by erosion, of the rocks originally overlying the granite would naturally assist in the formation of sheets. Joints, more or less at right angles to the fractures causing sheets, are also common, and in many cases the rounded forms resembling boulders, which granite often assumes in weathering, are primarily due to these various cracks. Evidently if a mass of rock be already to some extent divided into blocks by fractures, the corners of these blocks will be the first to suffer in weathering, and I have seen granite hills literally strewn with masses, large and small, looking just like water-worn boulders, and yet all were practically in place. In many of these rounded forms the agencies of weathering, such as changes of temperature and freezing of absorbed water, have developed concentric cracks giv-

ing them the structure of onions, so that thin shelly pieces scale off. Other causes besides weathering and relative scarcity of joints are likely responsible for great granitic domes, such as those grand examples in the Yosemite region, California, and possibly arches in the rocks which originally overlaid the granite, determine both the location and shape of the domes to a large extent. Folds would naturally be produced by or at the time of the intrusion of the granite, and in some cases, even should they have been lacking, the granite may have worked its way upward in spots by a kind of 'stoping' method, due to blocks from the roof becoming loosened and finally sinking in the molten mass.

Many rocks, especially in arid regions, outwardly present a dark, smooth, shiny appearance due to what is aptly termed 'desert varnish', but granites, particularly when coarse in grain, seemingly often weather too rapidly for this coating to form, so that they more or less retain their natural color. Hence, what with their characteristic rounded and boulder-like shapes and the frequent absence of the dark desert varnish, granitic rocks in desert countries are often easy to identify, though far away, and the accuracy of the determination can frequently be confirmed by carefully noting the character of the wash brought down from distant ranges. Desert varnish seems to have been produced by water, which, after soaking into the rocks, has subsequently been brought to the surface and evaporated by the heat of the sun, depositing the substances dissolved in a relatively insoluble form, the hard thin coating often consisting of quartz, iron oxide, and some manganese oxide. Thus, although an effect of weathering, this case-hardening greatly protects rocks from destruction, and is an excellent illustration of one method of adaptation to environment and the survival of the fittest in the inorganic world. The smooth shiny exterior may be due in part to the action of sand blown by winds, the sand-blasts polishing the varnished surface, but cutting deeply into rocks not so protected. Suffice it to say in this connection that while volcanic rocks, quartzites, and schists may take sharp angular forms, granitic rocks tend to become rounded, and, though in place, to assume the appearance of boulders.

Among minerals which are usually associated with or derived from granitic rocks may be mentioned the ores of tin, tungsten, molybdenum, tantalum, the metals of the rare earths, and various gems, some of these minerals being generally present in granites only in very small amounts, but sufficiently concentrated in pegmatites to be of economic value. Prospectors in search of gold and the more common metals are often unreasonably prejudiced against granitic rocks, and yet not only are there numerous excellent mines in granite, but many ore deposits though in other formations are directly due to the intrusion of granites, monzonites, and allied rocks in their vicinity. Fissures are naturally formed by the movements attending intrusions, and in a number of cases ores have undoubtedly been deposited from solutions derived from granitic rocks. Many a prospect can never be developed into a paying mine simply because it is too far from the granite.

*Bulletin 313, U. S. Geol. Surv., p. 36.

OLIVER CONTINUOUS FILTER.

Written for the MINING AND SCIENTIFIC PRESS
By A. H. MARTIN.

The Oliver continuous filter is the invention of Edwin Letts Oliver, metallurgical engineer for the North Star Mines Co., at Grass Valley, California. The filter consists of a rectangular wood or steel tank in which is partly submerged a filter cylinder revolving once every five or six minutes. The tank contains the slime, which is kept at a constant level by an automatic float. The filter-drum, through which passes a hollow trunnion, is composed of wooden staves mounted on cast-iron spiders. The surface of the cylinder is divided into 24 compartments, each section attached to an automatic valve by both a blow-pipe and vacuum-pipe, for the connection of suction and of compressed air respectively. The outer periphery of the compartments is covered with a specially prepared filter medium, in turn covered with light canvas. The entire drum is



Oliver Slime Filter.

wrapped with hard steel wire. Against the side of the cylinder, resting on the wires, is a flexible steel scraper, designed to assist the removal of the slime-cake.

The first filters built two years ago were 7 ft. long and 10 ft. diam., and have an approximate hourly capacity of two tons. All other filters operating in Mexico and this country are 11 ft. 6 in. diam., and of lengths varying from 7 to 14 feet.

When the formation of the cake is commenced a vacuum is applied to the vacuum-pipe by means of the automatic valve. The suction is equivalent to about 22 to 25 in. of mercury. The suction causes a cake of slime, from 1/4 to 1/2 in. thick to adhere to the submerged section of the cylinder. As the cake emerges from the slime it is dried to a consistence of about 30% moisture. A wash is then applied, which removes the last traces of dissolved gold and silver, and compressed air at 5-lb. pressure is admitted through the pipe to the section opposite the scraper. The vacuum is temporarily shut off at this section automatically, and the air admitted, which causes the cake to detach from that section and slide

down the scraper, from which it is removed by a spray of water, or by a belt-conveyor in case abundant water is unavailable. The change from suction to pressure takes place in one compartment immediately before reaching the scraper, and, after passing, the suction is at once restored. All of this is accomplished automatically. The cleaned canvas again passes into the slime and is ready for another cycle. It is thus seen that the action of the filter is continuous.

The weight of pulp on one side of the filter nearly balances the weight on the other, and but little power is required for operation, 10 hp. being ample for a 100-ton plant, including power for filters, vacuum-pump, and compressor.

Four of these filters have been in use at the North Star mines for two years, two at the North Star cyanide plant, and two at the Central cyanide plant. They have a capacity of 40 to 50 tons each, and have been treating a sticky clay slime, free from sand, and they have given excellent satisfaction. Practically a total recovery of the dissolved metals is accomplished, the residue showing less than 5c. per ton dissolved gold, even with the treatment of high-grade slime, which frequently occurs at these mines. Freedom from shut-downs, and small costs of labor and repairs, have tended to make these filters popular.

In addition to the filters in use by the North Star Mines Co., 20 are used in Mexican mills, and American plants. Both gold and silver ores are being treated, and results have been satisfactory in every instance, high-grade ores being as thoroughly washed as low-grade. The principle involved is a new one, and the filters are attracting the attention of metallurgists whenever they have been introduced in a new district.

Below is given a summary of costs of treating slime at the central cyanide plant of the North Star Mines Co. The mill-tailing is classified into sand and slime, and concentrate from the tables is also treated, so that one-third of the labor at the plant is charged to each product treated. As the tonnage is relatively small, the labor-cost bears a large proportion to the total cost of treatment.

| | |
|--|--------|
| | Cents. |
| Labor, including superintendence and office expense..... | 12.2 |
| Cyanide | 14.0 |
| Zinc | 2.0 |
| Lime | 2.0 |
| Sundry supplies and all extras | 3.0 |
| Power, 8 hp. at \$4..... | 1.6 |
| Filtering, maintenance, covering, etc..... | 0.3 |
| Filtering, lubricants, pump-repairs, supplies, etc..... | 0.5 |
| Total cost of slime treatment..... | 35.6 |

Maintenance of filters in detail is shown by the following total costs for a period of six months, which is the average life of a filter-cloth.

| | |
|--------------------------------------|---------|
| Filter-cloth No. 12 duck..... | \$ 8.00 |
| Burlap, 10 oz..... | 2.00 |
| Steel wire No. 16..... | 6.12 |
| Extra labor, 1 man, 16 hr..... | 5.00 |
| Sundries | 1.50 |
| Total maintenance for six months.... | \$22.62 |
| Total tons filtered | 7200 |
| Cost per ton filtered..... | 0.3c. |

INDUSTRIAL ACCIDENTS AND EMPLOYERS LIABILITY LAWS.

By DAVID ROSS.

*While the great loss of human life, consequent upon the operation of modern industry makes constant and proper appeal to the sympathetic, our treatment of the legitimate claims of injured workmen should be uninfluenced and as free as possible from considerations inspired by sentiment alone. From our present knowledge we are permitted to form a fairly correct estimate of the extent of the losses and suffering which the growing business and industrial interests of the country impose.

These, in the extra hazardous occupations, increase and decline in nearly exact proportion to the number of men employed and the amount of work they perform. There is but one effective way to prevent accidents, that is, to stop working. F. L. Hoffman, of New York, in the September, 1908, bulletin of the Bureau of Labor, estimated that the total number of fatal accidents in the United States last year was between 30,000 and 35,000. Out of an industrial population of nearly 30,000,000 the death toll last year was approximately 18,000. Our triple interests, transportation, mining, and manufacturing, represent in the order named the most hazardous occupations and make up the principal list of fatalities. Under the provisions of the British Workmens' Compensation Act, which requires in the case of death from accident a consideration equal to the total of three years' average earnings, our financial liability for the year 1907 would have totaled less than \$22,000,000.

Aside from railway statistics concerning accidents, we have nothing authentic as applying to the entire country. In the State of Illinois, the Mine Inspection Service, through the Bureau of Labor, has been collecting and publishing accident and other statistics for the past 30 years. Taking the per cent of accidents, of which we have a record in mining, manufacturing, and transportation in Illinois and applying them to those industries for the whole United States, gives the following approximate results:

| Industry. | No. Employed | Total Annual Wages | Value of Product. | Average Yearly Earnings |
|----------------|--------------|--------------------|-------------------|-------------------------|
| Coal mining... | 586,801 | \$368,832,322 | \$614,798,898 | \$629 |
| Manufacturing | 4,244,538 | 2,266,273,319 | 14,802,147,087 | 534 |
| Transportation | 1,403,840 | 882,726,920 | 2,589,105,578 | 629 |
| Totals | 6,235,179 | \$3,517,832,561 | \$18,006,051,563 | \$564 |

| | No. Killed. | No. Injured. |
|----------------|-------------|--------------|
| Coal mining | 2746 | 10,600 |
| Manufacturing | 900 | 8,400 |
| Transportation | 4534 | 87,644 |
| Totals | 8180 | 106,644 |

The following indicates, approximately, what part of the wealth produced through these agencies would

*Abstract of address before the American Mining Congress, Goldfield, Nevada.

be required to pay an average of three years' wages to the heirs of dependents of those killed, and compensation at the rate of one-half wages to those injured losing an average of 60 days' time each:

| | Per cent to pay for killed | Per cent to pay for injured | Per cent to pay for killed and injured |
|----------------|----------------------------|-----------------------------|--|
| Coal mining | 0.89 | 0.09 | 0.98 |
| Manufacturing | 0.012 | 0.003 | 0.015 |
| Transportation | 0.35 | 0.18 | 0.53 |
| Totals | 0.09 | 0.03 | 0.12 |

The addition of less than 1% to the valuation of the coal product of the country would furnish sufficient revenue, including the cost of administration, to cover the claims of the killed and injured according to the terms of the British compensation law, while twelve hundredths of 1% would perform a like service in the case of all casualties occurring in connection with mining, manufacturing, and transportation in the United States.

Legislation relating to the liability of employers contemplates the recovery of damages for injuries resulting from negligence. Under our system of judicial procedure, the burden of proving negligence rests upon the plaintiff, and the chief difficulty has been to produce the evidence. There are many accidents of such a nature that it is impossible to show responsibility on either side. Recovery is out of the question. There has also grown a system of judicial law, based on the relationship of the plaintiff to other workmen, known as the rule of fellow-servant or co-employment, the rule of contributory negligence, the doctrine of assumption of risk, and other vague and mysterious legal speculations that operate to defeat just and meritorious claims. Employers, on the other hand, complain, and with some justice, that legislatures, influenced by the love or fear of trade unions, are continually enacting laws against their interests; that the judgment of juries, softened by tears of tender-hearted attorneys, return verdicts in total disregard of justice conditioned more upon the amount the defendant can afford to pay than the loss sustained by the injured person; that unscrupulous lawyers take advantage of the situation and for a fee contingent on the verdict, encourage the prosecution of such claims; and that as a means of preserving their credit and avoiding bankruptcy, they are compelled to pay large premiums to casualty companies for incomplete protection. Out of this situation has grown the business of indemnity insurance. C. R. Henderson, of the Chicago University, in his recent work on 'Industrial Insurance', states that in one year 15 companies in Illinois collected in premiums \$1,825,467.57, and paid claims to the amount of \$867,940.95. He explains that it must not be inferred from these figures that this class of insurance companies is earning inordinate profits. It is claimed that the rate of commission alone for securing business, averages 25 or 30%, that the addition of other items such as salaries and expenses of special agents, rents, clerk hire, surveys, and inspections, would average one-half the premiums, leaving

the margin of profit about 10% of the receipts.

So far as insurance companies are concerned the extent of their profits whether large or small, is immaterial, the facts are that the system fails to meet the requirements of the occasion; that it is maintained at enormous cost to the industry without adequate benefits to the interests directly involved. It would seem that an institution which on the one hand fails to give complete protection to the employer, and on the other hand applies the greater part of its premium in an effort to defeat the claims of employees, is without defense. Beyond the premiums paid to registered insurance companies we have no means of knowing what such insurance costs. It is impossible to institute anything like a correct comparison, without an actual trial, of the expense of continuing present plans with that of compensating accidents according to a definite schedule. Whether the sum were less or more, there would, under the proposed system, be the satisfaction that whatever was disbursed would be distributed in a way that would render the greatest and promptest relief to the unfortunate victims of industry.

It might be asked if the adoption here of a measure similar to the workmen's compensation act of Great Britain would end all litigation so far as accidents are concerned. It would not, for the reason that the right to bring action in court to recover damages cannot be abridged, but here, as in other countries, the usual tendency would be to accept without litigation a specific sum rather than take chances on the uncertain results of a law suit. It would be better for everyone if this reform could be brought about through the medium of trade agreements, but, on account of the limited number who are affiliated with labor unions and organizations of employers, this is impossible and we must look to the compelling influence of general law to accomplish it.

INSURANCE AND MINE ACCIDENTS.

By G. W. TRAER.

*The consideration of insurance in connection with mine accidents usually relates to employers liability insurance only. While there may be some such cases, personally I know of none where a mine operator provides ordinary accident insurance for mine employees. In any event, mere accident insurance would not protect the mine operator against employers liability, until the actual acceptance of the insurance money by the person having the cause of action, in extinguishment thereof. A general practice of mine employees carrying collective accident insurance for themselves, in adequate amounts, would be highly commendable, because it would relieve a vast amount of misery and the distressing effects of abject poverty as well as beget or increase a tendency to thrift. But that question should be settled voluntarily by the employees themselves. Requiring an employer to furnish accident insurance for his employees would be merely an indirect form of compulsory compensation from employer to employee for all personal injuries. Employers may well consider

carefully whether some direct form of workmen's compensation for all injuries not caused by workmen's own misconduct, would not be highly preferable to the present wasteful and otherwise objectionable methods of litigation relating to compensation for personal injuries. It is believed by those in position to know something of the facts, that claimants on the average receive much less than half the total amount paid out by employers on account of personal injuries, court costs, and lawyers' fees, and expenses absorbing much more than half of the total amount expended. Such condition requires the most careful consideration upon the part of men of affairs.

The doctrine of employers liability for certain injuries sustained by work people in their employ is so deeply imbedded in American law, that it seems impossible to doubt that, in one form or another it will remain so. In its origin and down to comparatively recent years this liability depended upon distinct negligence on the part of the employer and it was subject to several important qualifications. The employee was held to a large measure of responsibility for occupational accidents to himself, almost or quite equally so with the employer. The doctrine of employers liability had no foundation in merely sympathetic feeling or in the relative financial ability of employer and employee. To be entitled to compensation, the injured person not only must show that the employer clearly was negligent but that he himself was free from negligence. The courts controlled or influenced, to a large extent, the finding of verdicts by juries. But in recent years legislatures, courts, and juries, have greatly broadened the scope of the employer's liability, and correspondingly lessened the responsibility of the employee for himself. At the present time an employer's neglect to comply with a statutory requirement practically makes him an absolute insurer of his employee's safety, in matters covered by the statute. Contributory negligence on the part of the employee cannot be pleaded. To recover a verdict it is necessary to show only that the person was injured and that neglect to comply with a statute was the proximate cause; and the word 'proximate' is given a liberal interpretation in favor of the plaintiff. In comparatively few cases do courts interfere with findings by juries, even though bias is plainly apparent.

The trend of public feeling, though not yet fully crystallized into definite public opinion and action, clearly seems to be in the direction of recompense to work people for substantially all occupational injuries. Care by employers for employees' lives and safety has greatly increased both voluntarily, by reason of higher moral sense on the part of employers, and by force of laws. In spite of this fact, employers' expenditures on account of personal injuries to employees has greatly increased during recent years. Litigation has been multiplied and the methods by which much of it is originated and carried on are degrading and subversive of respect for law.

Employers' liability insurance has had a large growth during recent years, but being merely a commercial venture for profit, it has accomplished

*Abstract of paper read before the American Mining Congress, Goldfield, Nevada.

nothing in an ethical sense. The matter is less properly a subject of commercial venture than life, fire, tornado, ordinary accident, or fidelity insurance. In those branches of insurance the mere occurrence of a certain event fixes liability upon the insurance company; it usually fixes the amount to be paid also, and there is comparatively little inducement to speculate on the outcome of litigation. Except in fire insurance, practically nothing can be done in the branches of insurance mentioned to avoid the occurrence of the event insured against. Mutual insurance limited to employers in the same light only, is better applicable to employers' liability for several reasons. Experienced men working almost directly in common can accomplish more in the way of preventing injuries. Their practical knowledge and experience is more directly available in the investigation of accidents and assisting to untangle technical facts and rules of law. Their local knowledge of persons and circumstances, frequently of great value, is drawn upon more freely; and altogether they are likely to feel and to exert a more direct interest in the details of mutual liability insurance than in the case of commercial liability insurance. As a matter of fact, mutual employers' liability insurance is no more than a co-operative method of seeking to lessen the frequency of accidents and of investigating and adjusting claims and averaging the ultimate cost. But the great problem which is nearing an acute stage is not a question of one form of insurance or another. There is a rapidly growing belief that society as a whole should bear the burden of industrial injuries, and the great industrial and humane problem to be worked out is how to distribute the burden equitably. This problem cannot be ignored. Willingly or unwillingly, employers must accept the solution finally reached, and it will be wisdom on their part to share in bringing it about.

A NUGGET WHICH MAY HAVE GROWN.

Whether gold nuggets grow or not in placers is a disputed question. The evidence in favor of such a hypothesis has never seemed conclusive, but each contribution tending to establish such action is of interest. There seems to be no reason why solution

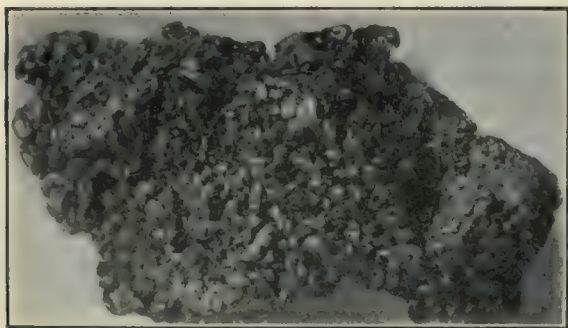


Fig. 1. Magnified 3 1-2 Diameters.

and re-deposition of gold should not occur in placers under certain conditions. In recent gravels the usual absence of sulphides would of course preclude the formation of the *ic* salts of iron and copper, which seem to be mainly responsible for solution of gold in veins in the process of alteration. The compounds

in placers are necessarily almost wholly oxidized, and the effect of organic compounds could not be great in the presence of such abundant oxygen. In buried ancient placers, like those of the California gold-belt and of the Australian deep-leads, conditions are different, and organic sulphur has resulted in the formation of sulphides of iron to no small extent. But the evidence of chemical re-arrange-

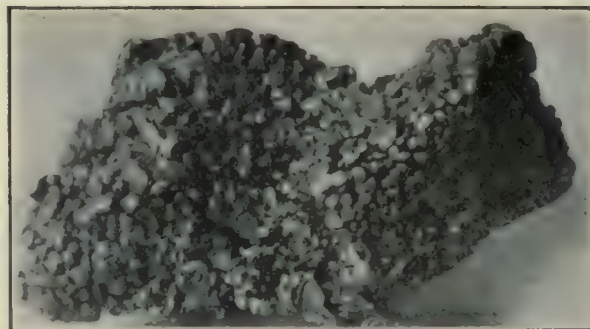


Fig. 2. Magnified 3 1-2 Diameters.

ment of the gold content of these placers is singularly wanting. A recent discovery of a nugget in British Columbia raises anew the question of such probable solution and re-precipitation of gold in a placer. The nugget is shown in the accompanying illustration, magnified so as to bring out the detail. The magnification is direct, and is not obtained by enlargement of photographs. These views were made by O. H. Packer. The nugget was found by three brothers, F. D., E. W., and C. L. Condit, of Hazelton, British Columbia, and was washed out of an exceedingly argillaceous gravel, hard and com-

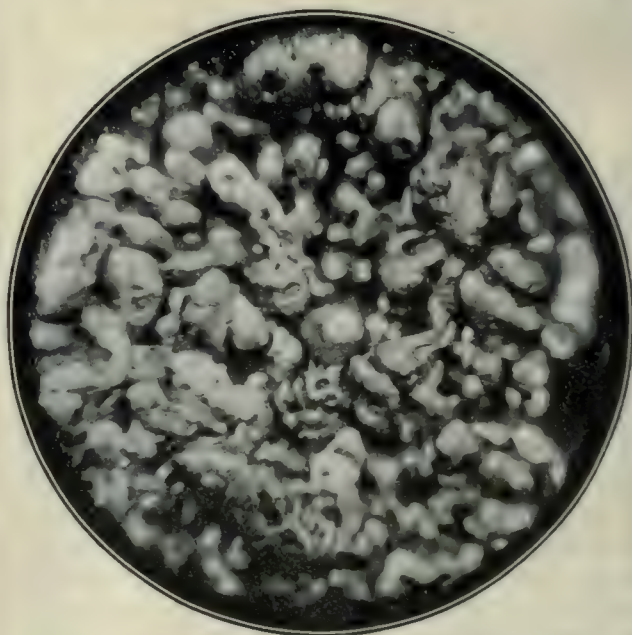


Fig. 3. Magnified 10 Diameters.

pact, from a depth of 20 ft. below the surface. This clayey gravel had been overlaid by a great depth of ancient glacial boulder clay, which had subsequently been eroded. The clayey gravel in which the nugget was found therefore has considerable antiquity. The deposit is about 120 miles east of Hazelton on Tom's creek, which flows into the Omineca river,

which in turn is a tributary of the Peace. The nugget is 1 in. long by 0.57 in. wide. As shown in Fig. 1 and 2, it consists of a mass of gold granules cemented by gold into a solid mass. The details, as revealed by the photographs, are as follows.

Fig. 1, obverse; nugget of wire gold and small gold grains firmly cemented. A few grains of quartz are imbedded between the grains of gold. Two of these quartz grains show crystallization faces and edges, though in each case the greater part of the original crystalline form has been obliterated by erosion. Many cavities occur in the gold grains, and the grains are cemented with gold. The cavities between the grains of gold extend entirely through the nugget in a few cases. The figure is magnified $3\frac{1}{2}$ diameters.

In Fig. 2 is shown the reverse of Fig. 1. On the

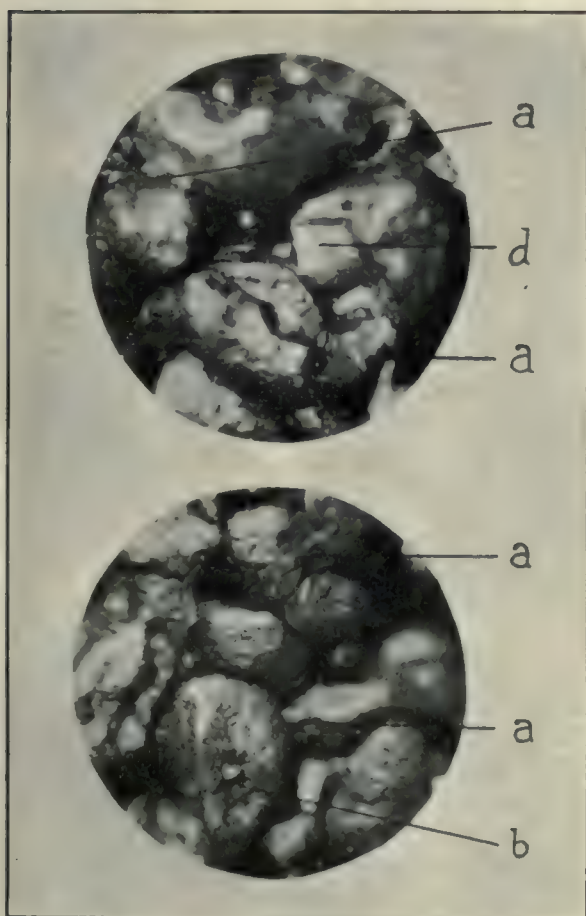


Fig. 4. (Above.) Magnified 30 Diameters.
Fig. 5. (Below) Magnified 28 Diameters.

lower right-hand projecting part a triangle face (octahedral crystallization) is plainly visible. Octahedral crystallization of gold is seen on several other small gold grains. The magnification is $3\frac{1}{2}$ diameters.

Fig. 3 represents a limited area of the nugget magnified 10 diameters. Cavities in the small gold grains show distinctly. Cementation is faintly shown.

Fig. 4 is of a limited area showing (a) gold cementation between smaller nuggets. In the centre of the field is seen a (d) gold grain showing distorted octahedral crystallization.

Fig. 5, a limited area magnified 28 diameters, shows (a) cementation with gold between the grains of gold, and (b) a cavity in a grain of gold.

YAKUTAT BAY REGION.

Yakutat bay lies at the base of the St. Elias range, about 30 miles southeast of Mount St. Elias, where the international boundary strikes due north. It is the only harbor on the 300-mile stretch of comparatively straight coast line between Cross sound, opposite Juneau, and Controller bay. The area has recently been discussed in detail by R. S. Tarr and Bert S. Butler, in Professional Paper No. 64, of the United States Geological Survey. According to these authors, the Fairweather and St. Elias mountains rise abruptly to great altitudes along the coast. At their foot, bordering the sea, is a lowland fringe or foreland of glacial débris. Numerous glaciers descend to the Yakutat bay foreland, the largest glacier on the American mainland, the Malaspina, a broad ice plateau covering an area as large as that of Rhode Island lying northwest of the bay. Hubbard glacier, at the northernmost point of the bay, is one of the finest examples of a tidal glacier on the continent. The Yakutat bay inlet has roughly the shape of a bent arm, with the shoulder at the ocean and the elbow at the foot of Hubbard glacier. The outer portion is called Yakutat bay, the mountain-walled stretch just south of the elbow Disenchantment bay, and the forearm portion Russel Fiord. Among the high peaks visible from the bay are Mounts Hubbard (16,400 ft.), Vancouver (15,617 ft.), and Cook (14,700 feet).

This region has been the scene of many explorations, an outline of which is given in the report. The first recorded visit was in 1786, when La Pérouse sent an officer into the bay in search of an anchorage. In 1792 Malaspina, an Italian in the service of Spain, was sent with two ships to test the accuracy of a report that the west end of the long-sought Northwest passage lay near Yakutat bay. The Russians built a fort at Yakutat in 1795. The more important explorations in the nineteenth century were those of I. C. Russell, of the United States Geological Survey, in 1890 and 1891, the international boundary survey in 1895, and the Harriman expedition in 1899. The expeditions on which the present report is based, were made in 1905 and 1906.

The Yakutat region is pre-eminently one of glacial phenomena, the topography being characterized as 'ice drowned'. The description of the origin, effects, present and former positions, and probable future history of the glaciers forms the major part of the report. Mr. Tarr states that the present glaciers are mere remnants of former ice floods which extended to the very mouth of Yakutat bay. Many of them are still actively moving and some descend to the shore. The topography of the region has been profoundly modified by the action of these glaciers in two ways—by erosion and by deposition. Deposition has produced the foreland fringe and minor accumulations of débris throughout the area. Erosion has broadened and deepened the fiords, truncated the tributary valleys, and left them hanging above the main valleys, steepened and straightened the valley walls, lowered divides, and, by irregular action, left nunatak knobs standing above the otherwise smooth fiord troughs.

FLUORSPAR GRADES AND MARKETS.

Written for the MINING AND SCIENTIFIC PRESS
By F. JULIUS FOHS.

*Fluorspar is classed as lump, gravel, and ground. Lump and gravel, spoken of together as crude fluorspar, may be had in three grades according to quality. Ground is to be had in four grades, but these are not correlative with the grades of crude fluorspar. The term 'gravel' is now used to include both the gravel resulting from disintegration of lump through natural causes, and a crushed product. Gravel is sold washed or unwashed. No. 1 fluorspar is usually white, less often slightly colored, and should run 96% or more calcium fluoride, the remainder consisting of silica, iron oxides, alumina, calcium and magnisiums, carbonates, alkalies, hydrocarbons, and moisture. Dark colored fluorspar, especially if somewhat shattered and iron stained, is not classed as No. 1, owing to the larger amount of silica it contains, such silica being deposited between the cracks in the weathering process. Colored fluorspar not so affected, if clear and highly crystallized, is not objectionable in this grade. Dark brown and purple black are not included in this grade at all, since they are usually charged with heavier and a larger amount of hydro-carbons.

American ground fluorspar is all No. 1 grade, but is classified into three sub-grades, Extra No. 1, No. 1, and No. 2. A still lower grade of ground is obtainable in England. No. 1 ground contains 98% or over calcium fluoride, and about 1% silica. This grade is generally used ground. Extra No. 1 contains less than 1% total impurities, with very little silica, and brings several dollars more per ton than No. 1. Extra No. 1 is produced from hand selected white lump fluorspar. While the bulk of that purchased by acid manufacturers is No. 1 (owing to the lower price), nearly all of Extra No. 1 also goes to them. No. 2 ground contains from 96 to 97% calcium fluoride with as much as 2% silica. It is of darker color than No. 1, the off color being due to the darker colored fluorspar, as well as to a small amount of lead, an impurity pleasing to some glass-makers. This grade is employed for cheaper wares of both the glass and enamel manufacturers. The bulk of the demand for ground fluorspar is for No. 1. Ground fluorspar is used, also, where a specially pure flux is needed. American ground averages 85 mesh in fineness. No. 2 fluorspar contains 90% or over calcium fluoride with less than 4% silica, the remaining impurities consist largely of calcite and sometimes limestone. Colored fluorspar, excepting unwashed and gravel, nearly all falls into this grade. The crushed product of the mills is also No. 2. Some of the lump of this grade will analyze 95% calcium fluoride, when it may be classed as Extra No. 2. This grade is largely used for fluxing purposes. No. 3 fluorspar includes, according to present usage, all material containing between 60 and 90% calcium fluoride. Unwashed gravel belongs to this grade, as does fluorspar associated with a considerable amount of calcite, limestone, quartzite, barite, and other

minerals. Mill tailing is No. 3. This grade is used as a flux in iron smelting, and especially where low-priced fluxes are necessary. A grade of English ground may be classed as No. 3 ground. This corresponds in quality with the best of No. 3 fluorspar, containing, it is reported, about 88% calcium fluoride.

I suggest that the fluorspar classed now as No. 3 be divided into two grades, to be designated No. 3 and No. 4; No. 3 to include fluorspar running from 80 to 90%. This grade would embrace most unwashed and not too dirty gravel; also lump fluorspar associated with not exceeding 12% silica in the form of quartzite, sand, or chert, and from 8 to 15% calcite or limestone. No. 4 would include all fluorspar containing 60 to 90% calcium fluoride, its silica content not to exceed 15%, with the remainder made up largely of limestone and calcite. This grade would embrace the mill tailing and fluorspar largely associated with quartzite or limestone. No. 4 grade would also embrace the artificial fluorspar by-product of cryolite. For the proposed No. 4 grade the demand is limited.

The ruling prices for fluorspar have remained practically constant for several years past. Occasionally a company has offered fluorspar at a lower price and caused temporary flurries in the market, but this only affected some particular grade and left no permanent effect. The difference in price between American grades No. 1, 2, and 3 crude, and also between the different grades of ground, vary from 50c. to \$3 per ton. Fluorspar of similar grade costs from 50c. to \$1.50 more in lump than in gravel, partly because of the higher cost of producing lump, and partly owing to the less silica content. Lump can be graded closer than gravel. Mining companies that do not market their own product sell the same to marketing companies at prices just sufficiently less than the ruling prices to pay the marketing companies for handling such product.

The imposition of a \$3 tariff on fluorspar has resulted in broadening the market for American fluorspar, without permitting an increase in prices. The latter are still regulated by foreign importations, but at Atlantic Coast ports and not at Pittsburg, as was formerly the case. The present cost of English fluorspar, including tariff at Baltimore, is \$6.10 per short ton, as against a minimum sale price of \$8 for domestic unwashed fluxing gravel, leaving a good margin in favor of the English. At Pittsburg, however, the conditions are now reversed; the present minimum cost of English fluorspar at Pittsburg would be \$7.44, whereas domestic unwashed gravel can be sold there for about \$7. This gives American producers the advantage of trade at practically all the open-hearth steel furnaces, since few, if any, are situated at coast ports or sufficiently near them to take advantage of English importations. The effect of English fluorspar competition will be felt at Pittsburg and vicinity until the large stock imported prior to the imposition of the tariff is exhausted. Nevertheless, large orders for domestic have already been given from that vicinity.

The range in prices f. o. b. mines, Kentucky-Illinois district, for 1908 were: unwashed gravel sold at \$4

*Published by permission of Charles J. Norwood, Director Kentucky Geological Survey.

to \$4.50; washed gravel (though a small amount of high-grade brought \$8) sold at \$4.50 to \$5.50; the average for all grades of gravel was \$4.62. No lump of No. 1 grade was sold. No. 2 lump brought \$5 to \$7, the average price being \$5.40. Although the average for ground was \$10.27, it sold in bulk as low as \$9; barreled ground for \$10.50 to \$15. The range in prices for 1909 has been: unwashed gravel, \$4.50 to \$5; washed gravel, \$4.75 to \$5.50; No. 2 lump, \$5.50 to \$6.50; ground in bulk as low as \$9; No. 1 and No. 2 ground, \$10 to \$11 per barrel; extra No. 1, \$11.40 to \$12 per barrel. According to Burchard¹ the price of fluorspar in Colorado varies according to calcium fluoride and silica content. The spar is hand cobbled gravel. The prices are: for 80% calcium fluoride and not exceeding 15% silica, \$5; for each per cent of calcium fluoride additional, 20c., so that 85% brings \$6 and 90% \$7 per short ton. Fluorspar for foundry purposes retails in quantities from 50 lb. to ton lots, usually barreled; crude from \$10 to \$20 per ton; ground \$20 to \$32 per ton. The smaller glass and enamel companies also purchase, at times, in small lots of from one-half to five tons. Specimen fluorite in one instance sold at \$60 per ton.

Illinois producers have, in certain instances, cut prices regardless of cost, to meet English and other competition, hence their average prices have been lower in some instances than those of other States. This condition cannot last much longer. The Kentucky shippers have been handicapped north and east of the Ohio river by a difference of 20 to 80c. per ton in freight rates. The low value of the Colorado product at the mine is explained by its high silica content and the high cost of haul, which Burchard writes,² is possible because of proximity to market (Colorado Iron & Fuel Co., Pueblo, Colorado). The Arizona product is handicapped by its distance from available markets.

The sources of competition that fluorspar must meet are three in number: (1) limestone flux, (2) imported fluorspar, and (3) cryolite and by-products. The production in 1907 of limestone flux amounted to 17,609,537 short tons, while in 1908 (an off year in the production of iron and steel) it fell to 10,710,737 tons. Of the total production over 90% is used in the making of iron and steel, the remainder being largely used in lead and copper smelting, about 4% for the former and 5% for the latter. The average price of limestone flux is 44 to 45c. per ton. By the use on an average of 3% of fluorspar per ton of limestone flux used (the percentage would be higher for dolomite, lower under certain other conditions)³ better results may be obtained without material increase in cost, since the combination of fluorspar and limestone makes a more powerful flux, reduces fuel consumption, and acts as a detergent, yielding metal of better quality; in addition, it means the handling

of less raw material, reducing the amount of storage space and labor required. Lead ore containing 5 to 10% fluorspar shipped from the Kentucky-Illinois district is not assessed a penalty, for the fluorspar is distinctly an advantage to the smelter as a flux. In copper smelting it is also an advantage. It will be seen from these figures that the legitimate increase in demand for fluorspar may readily grow to be ten-fold what it is at present. It may be interesting to note that the Fairview mine has reached a depth of 460 ft. The Nancy Hanks incline has been sunk to 340 ft. and is said to show a 9-ft. vein of No. 1 fluorspar.

The amount of fluorspar imported (chiefly from England) has been variously estimated from 30,000 to 100,000 tons annually. The average demand for domestic fluorspar has been about 37,000 tons annually. The tariff should increase this demand by at least 85% of the amount previously imported, through the exclusion of that much of the imported fluorspar. The tonnage reported quarried and mined in England from pits deeper than 20 ft. in 1907 was 49,551 short tons from Durham and Derbyshire, and in 1908 it was 38,250 tons from Durham and Midland. Since there is no law enforcing the giving of statistics for minerals obtained at less depths than 20 ft., the amount of fluorspar obtained from old dumps, far larger in quantity than the other, is not known, and it is this product largely that has entered so strongly into competition with domestic fluorspar. American fluorspar can be used for all purposes to which cryolite is put at less cost and with as good or better results, except the manufacture of sodium salts, for which the bulk of that imported is now used. The result is that the importations of cryolite have materially decreased since 1903, the importations in 1908 amounting to only 1259 tons. A small amount of by-product fluorspar (60% calcium fluoride) is obtained in making the sodium salts.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

S. L., Oasis, California: Specimen in massive white barite.

E. L., Lucky Boy, Nevada: Quartzite with scales of green chlorite.

W. W. R., Stewart, British Columbia: No. 1, brown massive limonite coated with the earthy yellow ochre; No. 2, yellow ochre.

J. S. L., Ibapah, Utah: No. 1, limonite with a bright iridescent coating, possibly due to slight alteration of surface; No. 2, rhyolitic lava; No. 3, an altered feldspar porphyry.

H. F. L., French Gulch, California: No. 1, an altered porphyry containing quartz and feldspar crystals in a serpentine base; No. 2, a quartz breccia consisting of quartz and chalcedony pebbles and fragments with an earthy silicious cement.

¹Burchard, Ernest F. 'Fluorspar in Colorado', MINING AND SCIENTIFIC PRESS, August 21, 1909.

²Burchard, Ernest F. 'The Production of Fluorspar and Cryolite in 1908', Abstract from Mineral Resources, U. S. Geol. Survey, 1908, p. 3.

³Foels, F. Julius. 'Fluorspar', MINING AND SCIENTIFIC PRESS, June 26, 1909. See also 'Fluorspar Deposits of Kentucky', Kentucky Geological Survey Bull. 9, 1907, pp. 169 to 174, on its use in copper and lead smelting.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Records in Tunnel Driving.

The Editor:

Sir—Referring to your issue of October 30, page 590, in an article on 'A World's Record in Tunnel Driving', it is stated, in reference to the Los Angeles aqueduct, that the best previous known American record of speed for double-shift work was that made on the Gunnison Reclamation tunnel in March 1906, when a distance of 810 ft. was driven. In this connection, I would say that George W. Jackson, Inc., in the construction of what is known as the South West Land and Lake tunnel, a part of the Chicago Water Works system in the southern part of this city, has made a record of 464 ft. in 27 days, working one shift. In this work shots were fired by electricity, and it is not my understanding that a special effort was made for a record, since there was plenty of time to finish the work.

A. BEMENT.

Chicago, November 3.

Metal Losses in Copper Slags.

The Editor:

Sir—I am glad to observe that J. Parke Channing has taken interest in points suggested by the data I recently published in an article on the 'Metal Losses in Copper-Slags', and I sincerely hope that he and others will endeavor to collect and publish further information on these matters of high technical importance. The slags I submitted to examination came from both blast and reverberatory furnaces, making first copper matte of usual grade, namely, 25 to 50% copper. Both classes exhibited similar deficiencies in the ratios of the precious metals to the copper contained by the slag and matte respectively. That is to say, the slags contained less silver and still less gold than should have accompanied the copper of the slag if this copper had all been of the grade of the matte simultaneously occurring in the copper-smelting operation. I did not think it worth while to commence the enquiry by investigating converter, refinery, or black copper slags.

As stated in the paper, the facts observed leave room for belief that some of the copper of the slag may have been existent as silicate. Mr. Channing's suggestion that some of the silver might be in an oxidized form is worthy of investigation. I have no data that would throw much light upon this point. Such as I have, and some will be published later, show that in the ordinary migrations of copper through a cooling mass of slag, or in its precipitation by special methods of fusion, the silver follows the copper. It is well known, for instance, that a bar of lead bullion does not contain its silver equally distributed. The outside contains more than the inside. This is a case of what I have mentioned above as 'migration' in cooling.

In the same manner the shells of slag formed in slag-bowls contain more copper than the inner liquid portion. In cases I investigated, the copper in the shells was not uniformly distributed through the shell. It varied according to position, but the variations of the silver follows the variations of the copper. It looks like a case of molecular segregation in which the three metals, copper, gold, and silver, behave similarly. Circumstances alter cases. I did not observe a falling off of 40% in the copper of the slags when changing from oxidized to sulphide charges in blast-furnace work, as noted by Mr. Channing. I cannot help thinking that the temperature of the slag formation may affect the slag in its power of retaining copper.

LEWIS T. WRIGHT.

San Francisco, November 16.

Ely Central.

The Editor:

Sir—Ely has been quite excited about the attack on Ely Central. The article was apparently inspired by the Nevada Consolidated, which wants the ground between its steam-shovel pit and the Ruth mine. The Nevada Consolidated is getting close to the Ely Central ground in the pit. The two bore-holes, the results of which are quoted by *The Engineering & Mining Journal*, were stopped on account of the caving of the hole. The last one was only finished on Tuesday of last week, so the results must have been telegraphed to New York. The line between the rhyolite and the porphyry is marked by a fault which has a dip to the east between 20 and 25°. The last bore-hole struck the ore at 165 ft. and was in ore when it stopped at 335 feet.

Assuming the continuance of the same dip of the fault to be 20° or more, which is what is claimed, then for the bore-hole above mentioned to have struck ore at 165 ft. means that this was above the fault. The Nevada Consolidated has taken about 25% of its ore from under the rhyolite and has removed about 250,000 yd. of rhyolite overburden. I heard the drill runner tell about striking this ore at 165 ft., and I also heard him say that the hole gave an enormous amount of trouble on account of caving ground. This, no doubt, diluted the samples. In any case, many holes in the district show low percentages of copper for a considerable depth, and then even up the average by better-grade below, or may be low-grade all their depth. I saw the sections of all the Giroux company's bore-holes. The United States Geological Survey has been at work in the district all the summer and has found an area of porphyry that crops on the east side of the Ely Central ground from under the rhyolite just west of a narrow outcropping of limestone between it and the Star Pointer shaft of the Nevada Consolidated. The claim has always been made that the rhyolite was a dike. The evidences that it is a flow are unmistakable. All around the edges volcanic breccia and obsidian are found. Later disinterested geological study has resulted in estimating the porphyry area on the east end of the Ely Central ground as being about four acres in extent.

No one can see into the ground, and the statement

made by *The Engineering & Mining Journal* that the bore-holes in the rhyolite have not found ore is untrue. Nine have been put down, according to F. S. Pheby, the general manager for the company. The rhyolite at present existing is only a remnant of the sheet that covered the surface, and the whole question is whether the enrichment of the porphyry took place after the erosion of the present exposed areas, or before. It does not seem reasonable to think that it took place since the erosion, and on this basis there are as good chances of finding ore in the Ely Central ground as there were in the Nevada Consolidated when Mark L. Requa took up the property.

The Engineering & Mining Journal derides the limestone deposits. If they are correct, then the Cole-Ryan people are idiots to put so much money into limestone claims. Cole is buying up every bit of limestone country in the district that he can get where it shows any jasperoid. The ore is found close to the contact of the jasperoid (silicified limestone) and the limestone. The Giroux has a large tonnage of ore running from 10 to 15% copper. The Ely Consolidated has opened up what promises to be a good mine in the limestone, having found copper pyrite and also massive pyrrhotite carrying copper. All of this ore contains gold and silver of good assay values. From \$6 to \$7 per ton is claimed. I have no hesitancy in stating that I consider the chances of finding a mine on the Ely Central as extremely good. The Ely Central people, I understand, are going to put down some bore-holes in the porphyry zone to prove whether the ore exists or not. This should put an end to the controversy for all time.

C. S. HERZIG.

Salt Lake City, November 12.

Calculation of Blast-Furnace Charges.

The Editor:

Sir—In your issue of November 13, Percy E. Barbour has made some observations on the calculation of blast-furnace charges, and has given a charge calculation for pyritic copper smelting. He has brought out some interesting facts on the neglect of this necessary preliminary, due, as I believe, often from the apparently formidable undertaking, when as a matter of fact, once learned, its details can be carried in mind, and such computations can be made without reference to notes and formulas.

As to the first excuse by Mr. Barbour, namely, that the charges are put on the furnace before results can be got from the laboratory, this might be indeed true; but in any works where the ore is sampled it should be possible to get results soon enough for such use. 'Where there is a will there is a way'. In copper smelting, quite differently from silver-lead smelting, a great variation in slag composition is permissible, and hence has risen a carelessness in the preparation of the charge. Nevertheless, there is no reason why a slag should not be run which shall on the whole be the most satisfactory and profitable. As regards the practice at the Garfield works, there is no question that the officials are well acquainted with computation of charges, and, if they have adopted another system, it is because they are using a charge composed of two or three ores of

approximately the same composition. Hence, with a determination of the resultant slag, it should be possible to do good work. Even when a charge has been computed, the slag which is produced should be controlled by the eye as well as by analysis; and this is applicable to silver-lead charges also, though such control in this latter case calls for long training and continued close observation, controlled by results from the laboratory. In fact, today we find but few metallurgists who depend upon the physical examination of such slags, because of the difficulties involved in so doing. In addition to the excuses already given, I have had it stated to me that the material of the charge varied so that a charge calculation would not hold good. Indeed, careless bedding, careless weighing, and variations in the fluxes and fuel, reveal themselves by important variations in the slag and in its cleanness.

Referring to the singulo-silicate slag, which Mr. Barbour proposed to use, we find in pyritic practice that the metallurgist is chiefly anxious that his slag should carry specified quantities of silica (in this instance 44%), and that the bases go as far as possible with the addition of no more dead limestone flux than needed. The total of SiO_2 , FeO , and CaO , adds up in the present case to 92%, while in practice the sum varies between 85 and 90 for Utah ores.

The charge calculation, No. L 16, assumes a loss of sulphur by volatilization of 85%, a figure higher than my inquiries have warranted. Again, no allowance has been made for sulphur entering the slag, and since this will approximate 1%, there is 28% of sulphur so produced. Taking the figures as given in the article, there would be 29% of sulphur in the matte, while this element in practice commonly amounts to 23 to 24. Copper matte is so complex a compound that one cannot figure its composition from the atomic weights. Thus not all the copper is combined as Cu_2S , nor is the iron present altogether as FeS . For a discussion of this subject, I would refer to a paper by Charles H. Fulton and I. E. Goodner in the *Bulletin of the Amer. Inst. M. E.*, November 1908, p. 859, or to the synopsis of the same in the 'Mineral Industry', Vol. XVII, p. 276. No allowance has been made for the copper which goes into the slag, in this instance 0.3 to 0.5%, or from 10 to 14 lb. This, taken from the total weight of the copper present, would leave only 20 to 22% in the matte instead of the 27% given. I would also note that no columns are left for the percentages of moisture and for the wet and dry weights, respectively. Hence if ore 'B' contained 5% of moisture its scale-weight should be 1260 lb. in place of 1200 lb. as given.

I have given in my work on the 'Metallurgy of the Common Metals', the charge-calculations for iron, silver-lead, and copper charges, based upon the trial method, which I have found practically the most used by smelter men. Since, in the final summing up, this computation is used to check the results, why not use it from the beginning? It is a practical method, and, in the hundreds of calculations I have made, has proved to be the most satisfactory.

L. S. AUSTIN.

Salt Lake City, Utah, November 18.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

The Federal mining law does not extend to Texas, Porto Rico, nor to the Hawaiian Islands. The Philippine Islands have a special Federal Act relating to mines and mining.

The purpose of the law in requiring placer locations to conform as nearly as practicable to the rectangular system of the public surveys is to prevent 'shoe string' locations and carving the public domain into irregular shapes. A placer location should be rectangular in form even when upon unsurveyed land.

Silver chloride is nearly insoluble in water. When kept in contact with water three hours, traces will go into solution. When one part of silver is precipitated as AgCl in the presence of one million parts of water, a slight bluish tint is observed from dissolved AgCl. A distinct precipitate of AgCl does not fall until 4 parts of Ag are thrown down as AgCl in a million parts of water.

Chains may be tested as to defects by heating on a forge to dull red, and annealing by being allowed to cool slowly. After such treatment flaws, strained or elongated links may be readily detected. The safe working-load of a chain in tons may be found by squaring the number of eights of an inch in the side of the link, and marking off the last right-hand figure as a decimal. Thus a $\frac{3}{8}$ -in. chain would have a safe working-load of 0.9 ton.

Guano to the amount of 12,000,000 tons has been exported from the Chincha islands, off the coast of Peru. The exportation at present, amounting to 60,000 tons per annum, comes from the islands of Lobos de Tierra and Lobos de Afuera, situated off the coast of northern Peru. Many other islands contain deposits of importance. The nitrogenous constituent of the guano extracted today is said not to be so high as that in the great deposits formerly worked.

Luzonite is a name given to a variety of enargite occurring in the island of Luzon, in the Philippines, where it contains 47% copper. At Mancayan, district of Lepanto, Luzon, it occurs in copper veins in which the order of deposition of the minerals has been quartz, pyrite, enargite (luzonite), quartz, tetrahedrite, and barite. Enargite is a primary mineral at many places, as in the copper mines of Butte, and Tintic. The composition of enargite is expressed by the formula Cu_3AsS_4 . It occurs in large masses at Morococha, Peru, at an altitude of 15,000 ft. above sea.

Tungsten yields to magnetic concentration, and may be readily separated from its ores by a machine of the Wetherill type. In practice the crushed and sized ore is passed first over a belt under magnets in which a field is developed by a current of less than three amperes. This removes any oxidized

iron products and minerals rich in FeO , such as garnets, chromite, and so forth. The residue is then passed through a second machine taking current at from $3\frac{1}{2}$ to 4 amperes, which lifts out the wolframite. Cassiterite may thus be freed from wolfram also. Concentration by ordinary methods should precede the magnetic separation.

Silver-lead mines were operated by the Chinese in what is now the Sterne valley, Burma, in very early times. Active smelting operations were carried on here as late as a century ago, the smelting being done in low shaft-furnaces. Immense slag dumps remain, which are being re-smelted in modern furnaces. Some of these dumps contain as much as 100,000 tons of slag. A typical sample shows a composition of silica 8 to 12%, iron and alumina 8 to 9, lead 48, zinc 16, sulphur 3, and silver $2\frac{1}{2}$ oz. per ton. The lead is present in the slag mainly as PbO , less than 3% being in the form of prills.

Radio-activity of natural waters is now recognized as an important feature. The curative properties of many depend largely upon the radio-active substances present. That is why artificial mineral waters, of identical chemical composition do not produce the same beneficial results. The activity of the thermal waters in the Yellowstone National Park is particularly great, reaching 834 electro-static units in the spring near Clepsydra geyser. The Karlsbad waters vary in different springs from 2 units to as high as 94. Many European mineral waters have high radio-activity.

Setting of portland cement is a phenomenon not fully understood, but it is assumed that the action is brought about by the hydration and crystallization of the calcium aluminates, which occurs with great rapidity on adding water to the cement. This constitutes what is known as the initial set. Following this occurs hydrolysis of the calcium silicates, the latter being slowly decomposed and broken down into the simpler mono-calcium silicate, with the liberation of calcium hydrate. As this forms in excess it crystallizes out of the solution. This cycle of operations continues for long periods in the process of hardening of cement.

Monel metal, a new alloy of nickel recently put on the market, contains 68% of nickel, 1.5 of iron, and 30.5 of copper. It is silver white and takes a brilliant finish which it retains indefinitely. It is said to possess a tensile strength about 25% greater and an elastic limit about 50% higher than the best rolled steel, and it has, besides, the additional quality of incorrodibility. The mechanical possibilities open to such an alloy are endless. For example, the small cast propellers used in hydroplanes or high-speed motor boats are subjected to enormous strain. Some propellers used in such boats make 1500 to 2000 revolutions per minute. The strain on a blade 16 in. long, with a pitch of 40° , and with the edge of the blade thinned down to $\frac{1}{8}$ in., is so great that an extraordinary metal is required for this use. Manganese bronze bends at the blade tip and becomes useless, but monel metal has been fully tested in such service and proves to be absolutely rigid.

Special Correspondence.

LONDON.

Rhodesia.—De Bavay Flotation Process. — Otavi Mines and German Southwest Africa.—Globe & Phoenix.

The twentieth anniversary of the founding of the British South Africa Co. occurred October 29. The event was allowed to pass by without any public notice, not even the Englishman's proverbial dinner. Rhodesia is commonly held to have been scarcely a success, but such a view is not quite fair to the country. It expresses a reaction on the part of shareholders in the chartered company, who were promised all sorts of impossibilities in the way of dividends and appreciations of capital. If the country itself be considered apart from the unfortunate joint-stock enterprise, progress has really not been discouraging. It is true that no bonanza mines that would pay without railway communication have been discovered, but gold production from low-grade mines has been substantial, if not profitable to investors. There are, moreover, possibilities in the way of copper, lead, and zinc. When it is remembered that until 1890 the whole country was under the despotic sway of Lobengula's uncivilized hordes, the change that has been effected is more apparent. The number of miles of railway open ten years after the granting of the charter was 252, and at the end of the second decade had been increased to 1494, not counting the 506 miles in Bechuanaland and Cape Colony constructed by the Rhodesia railway company. By the end of this year a further 130 miles will be opened to the Congo border, making a total of over 1600 miles in Rhodesia. The total value of gold produced up to 1898 was £83,052; during 1908 it amounted to £1,678,000. It is also worthy of note that from 1895 to 1908, out of a total value of £15,000,000 of imports, £9,000,000 represented purchases from the British Islands. According to the census, taken in September 1907, the European population of southern Rhodesia numbered 14,007; and since that date the annual rate of increase has been much larger than in former years, and the population today probably exceeds 16,000.

The De Bavay flotation process is not so well known as some of the others of the same class. It depends solely on surface tension of water, and according to experts who have thoroughly tested it at Broken Hill, can be operated cheaper than any other. Recently the plant has been rebuilt on a larger scale and important contracts have been made for the treatment of zinc-tailing. The company known as the De Bavay's Treatment Co. has been re-organized under the name of Amalgamated Zinc (De Bavay's), Limited. The capital of the company is £500,000 in shares of £1 each. Of these 247,500 go to the shareholders in the De Bavay's Treatment Co., and 122,500 are being offered to the public. The issue was largely over-subscribed in Australia and London. The company acquires the old and new mills and large amounts of old and current tailing. The works and plant are situated on the property of the North Broken Hill Mining Co. The old mill treats 1800 tons per week, and the mill in course of erection will treat from 6000 to 7000 tons per week. The first half of the new plant will be completed by the end of this year and the remainder in March or April next. The cost of the new mill will be about £100,000. The stock of dump-tailing acquired comprises 100,000 tons from the North Broken Hill mine, already paid for; 370,000 tons from Block 10 mine, partly paid for; and 100,000 tons from Broken Hill South Silver mine, to be increased to 150,000 before the new mill starts operations. The last-mentioned tailing will not be paid for in cash, but will be worked conjointly. Contracts have been made with the North and South companies for their output of tailing, in the case of the first for ten years, and of the second for seven years, which may be extended under certain conditions to ten years. The yearly amount from the North will be from 120,000 to 160,000 tons, and from the South 160,000 tons. Contracts have already been made for the disposal of the whole of the concentrate produced during the ten years. During the first half of 1909, the old mill treated 47,370 tons of zinc tailing, averaging 18.3%

zinc, 3.7% lead, and 3.4 oz. silver, and produced 14,646 tons of zinc concentrate assaying 48.6% zinc, 6.1% lead, and 5.8 oz. silver, together with 256.5 tons of lead concentrate assaying 54.6% lead, 13.8% zinc, and 23.4 oz. silver. The profits were £17,427, with zinc at £21 12s. and lead at £12 10s. per ton. The separation into zinc and lead concentrates is not as perfect as it might be, and the lead product does not appear to be especially valuable.

Many improvements, however, have been made, especially in the treatment of leady tailing from Block 10, and these will be incorporated in the new mill. In future the lead content of the zinc concentrate will be decreased, and in the lead concentrate the lead content will be increased and the zinc content decreased. The cost of treating North and South tailing in the new mill is estimated at 6s. per ton, and of Block 10 tailing 7s. per ton; the costs in the old mill vary from 6s. 10d. to 8s. 2d. The price paid for the zinc tailing varies considerably from 1s. 6d. to 5s. per ton, and in the case of the South tailing the cost is worked out on a conjoint plan. The figuring of the profits is, therefore, complicated, but the prospectus treats the subject in full detail, calculating the profits with varying percentages and prices of zinc. With zinc at £21 per ton, the yearly profit is estimated at approximately £110,000.

The Otavi Mines & Railway Co., a Berlin corporation, owning the Tsumeb copper and lead mine in German Southwest Africa, and the railway connecting the mine with the coast at Swakopmund, after passing through a troublous youth is now becoming a profitable undertaking. The ore-bodies are rich and extensive, but being complex have presented difficulties in concentration and smelting. Until recently the ore was hand-picked, and the richer portions thus collected were exported. More recently the non-shipping ores have been smelted locally and the copper matte and lead exported. The company was formed in 1900 and the capital is £1,000,000 in ordinary shares, together with 200,000 deferred shares. The first dividend was paid for the year 1907-8, being at the rate of 9% on the ordinary shares, and 4% on the deferred shares. The report for the year ended March 31 has just been issued. The profit on the mining operations was £91,235 and on the railway £122,191, after full allowance for depreciation, renewals, etc. Out of the total profit £110,000 has been distributed as dividend on the ordinary shares and £60,000 on the deferred shares; the board receives a bonus out of profits of £13,333 and the remainder of the balance is put to reserve fund or carried forward. The amount of ore raised was 44,250 tons, as compared with 25,700 tons the year before. Of this 27,000 tons averaging 17% copper, 30% lead, and 12 oz. silver were shipped, and the remainder, 17,250 tons, were smelted locally, producing 3000 tons of lead containing 24 oz. silver per ton, and 3150 tons of copper matte containing 42% copper, 23% lead, and 16 oz. silver. An improved dressing plant is being erected. Hitherto the mining operations have consisted almost entirely of open workings, but it was found desirable a year ago to adopt underground mining below the first level. It is intended to introduce machine-drills before long. Proposals have been made by the German Colonial Office to acquire the railway by purchase, and in all probability the transfer will be made in April of next year. The purchase price will be £1,100,000 and the money so received by the Otavi company will be distributed among shareholders as a return of capital.

In the London letter, in your issue of October 16, reference was made to the case of the Globe & Phoenix mine in Rhodesia, the shares in which had enjoyed a big spurt in the London stock market without the directors publishing any news to the shareholders that would account for the rise. It was generally supposed that those in authority were speculating on their own account without letting shareholders and the public into the secret. The directors have protested against such a construction being placed on their actions, and as they are men of honor their word should be taken. An almost identical phenomenon has been seen in connection with the shares of the Sheba Gold Mining Co., operating in the Barberton district, of the Transvaal. This company did well during the years 1891 to 1898, but has since paid no dividend. In fact in 1904, additional

working capital had to be raised by means of re-construction. During the year ended June 30 last, 96,100 tons were milled, yielding by amalgamation, concentration, and cyaniding, a total of 25,944 fine oz. of gold. The extraction is returned as 87½% of the contents, as compared with 74% a year ago, but the manager, Howard Hill, rightly draws attention to the fact that substantial amounts of rich concentrate were held over from the previous year, and consequently made the increase in the extraction more apparent than real. About a year ago the directors came to the conclusion that work should be concentrated on one or two parts of the property, instead of there being so many scattered workings. This was accordingly done, and the ore is now being drawn chiefly from the Insimbi and Zwartkopje. During the year covered by the report the development did not bring to light any ore of over 7 dwt. value, but since then some important discoveries have been made on the Rosetta property. At the meeting of shareholders held at the end of October, the directors were able to announce that some high-grade ore had been found. At a point only 15 ft. from the surface a vein assayed 15 dwt., and at 40-ft. depth the assay was 24 dwt. over a width of 54 in. Similar assays have been given at other points and there seems a good chance of a valuable orebody being developed. The directors were placed in a false position by somebody on the spot supplying the information to London speculators, who commenced to boom the market before official news was published. The directors properly told shareholders at the meeting that they did not care to publish every promising assay, for in the past there have been many disappointments owing to the rich parts being patchy, and they gave a specific warning in the present case that the new discovery must not be magnified into a bonanza.

TORONTO, CANADA.

Cobalt Lake Litigation.—Hydro-Electric Power Difficulties.—La Rose.—October Production —Provincial Mine Output.

In the now celebrated case of the Florence Mining Co. against the Cobalt Lake Mining Co., claiming, on the ground of previous discovery, a large area of the bed of Cobalt lake, Chief Justice Moss, of Ontario, has issued an order allowing the Florence company to appeal from the adverse decision of successive Ontario courts to the Imperial Privy Council, and approving the security given by a deposit of \$2000. The Government of Ontario, refusing to admit the claim of the Florence company, afterward sold the bed of Cobalt lake to the Cobalt Lake Mining Co. for \$1,085,000 (which in the light of subsequent developments appears to have been a losing deal for the latter company) and, on the Florence company bringing an action, confirmed their title by a special act of the Legislature barring all other claims. The decision of the lower court, given June 15, 1908, was based upon this act, Judge Riddell ruling that "the Legislature within its jurisdiction can do anything which is not naturally impossible and is restrained by no rule human or divine. If it be that the plaintiffs acquired any rights—which I am far from finding—the Legislature has the power to take them away. The prohibition, 'Thou shalt not steal', has no legal force upon the sovereign body, and there would be no necessity for compensation to be given. We have no such restriction upon the power of the Legislature as is found in some States." This judgment was subsequently affirmed by the Court of Appeal. While Judge Riddell's dictum as to legislative powers is undoubtedly applicable to the British Parliament, and presumably to that of Canada, there may be room for the contention that it does not hold good as regards a subordinate body like a Provincial Legislature, and the result of the ultimate appeal will be watched with interest in legal as well as in mining circles, especially as a similar question has arisen in connection with the hydro-electric policy of the Government. It is rather a long story, and I will merely briefly outline its more important phases.

The Whitney government of Ontario came into power largely owing to the feeling that its predecessors had been too subservient to corporation interests, and a considerable section of its following strongly favored public ownership

of public utilities. Early in its career it undertook to supply cheap electric power from Niagara Falls to a number of the principal cities and towns of western Ontario. This was to be done by purchasing the power from the electric development companies already established at the Falls and forwarding it by a Government-owned transmission line to be operated by the Hydro-Electric Commission with a member of the Government as chairman. The Act embodying the scheme, passed in 1906, authorized the Commission to sell power to any municipality which should by vote of the rate-payers authorize the estimates of the cost of the power and specifications, and the terms of a provisional contract. In accordance with this provision, by-laws were passed in many places stating the price which power delivered ready for distribution would cost. After these by-laws had been adopted, the Government changed its plans, declined to set a fixed price at which the power would be delivered locally, and passed a new Act requiring the municipalities to take the power at \$10.40 per horsepower per year at the Falls, and to pay in addition further sums not ascertained for construction and operation of the transmission line. New contracts embodying these terms were presented to the municipalities, and in many cases signed without being submitted to the rate-payers, though in some instances strong exception was taken to this as illegal, and several lawsuits were brought to test the question. Again Premier Whitney resorted to the 'sovereign power' of the Legislature, and Acts were passed in 1908 and 1909 declaring the contracts valid and staying forever all actions pending which attacked the validity of any contract or by-law, or called in question the jurisdiction or authority of the Commission. Extensively signed petitions from financiers, as well as those whose local interests are affected, have been sent to Ottawa urging the Canadian Government to exercise its power of disallowance and set aside this legislation, which is represented as being highly injurious to Canadian credit abroad, but judging from the precedent set in the Cobalt Lake case, it is not likely that there will be any interference from that quarter. Sir Wilfred Laurier having just now troubles of his own in connection with the question of naval defence, will hardly care to raise the issue of 'Provincial Rights', which has in the past caused such long and embittered controversies between governments and parties. But the matter will assume an entirely new phase should the appeal in the Cobalt Lake case prove successful on the ground that the Ontario legislature had exceeded its jurisdiction. Such a decision would mean the overthrow of the whole hydro-electric policy; a much more important and far-reaching matter than the claims of the rival mining companies to a somewhat doubtful prospect.

Cobalt is under a cloud at present owing to the further break in La Rose, which appeared to be slowly recovering itself from the slump caused by the throwing on the market of large quantities of stock held by New York interests when a fresh break occurred early in the month, sending the stock down slightly below par, at about which point it remains. This drop was due to the statement issued by the new president, D. L. McGibbon, of Montreal, and some of the other directors of that city, where the controlling interest is now held, who after a visit of inspection to the properties made a disclosure that startled the public. This statement points out that the La Rose mine is the only one of the properties which can be said to be fairly well developed; that it has been furnishing almost exclusively the money to pay dividends and develop the other properties; and that while on June 1 it still showed estimated ore reserves close on 5,000,000 oz., it was not to be expected that it could furnish for an indefinite period enough to pay dividends at the present rate and to bring the other properties to the productive stage. They therefore decided to reduce the dividend to 8% per year and to put aside an increased amount for developing the other claims. They expressed surprise that so little work had been done on these, and noted that lack of power had caused much delay. Compressed air had been promised by the Cobalt Hydraulic Power Co. on July 1, but it was not expected to be available before January. The most disappointing feature of the

statement, however, related to the Lawson, the main vein of which, known as the 'silver sidewalk', is only yielding low-grade ore at the 88-ft. level. This revelation has had a tendency to weaken confidence in Cobalt generally, as so much had been expected from this vein. The La Rose slump has affected the whole list unfavorably and there are no indications of any immediate recovery.

Cobalt shipments for October amounted to 2356 tons, being 594 tons less than in October 1908. No new shippers have developed, several mines which have been announced from time to time as preparing to make consignments having so far failed to make good. La Rose was as usual first on the list with 717 tons, and Nipissing came second with 440 tons. In cheering contrast to the gloomy features of the situation is the presentation by the Crown Reserve of an extra Christmas bonus of 10% to its shareholders, in addition to the regular quarterly dividend of 6% and bonus of 9%. This brings up the total distribution to shareholders to 70% for the year.

Now that the Ontario Government has sold the Provincial mine and adjacent properties, there is no longer any reason for concealing the facts as to the value of the ore extracted during its operation. In the annual report of the Bureau of Mines for 1909 just issued the figures are given. Three shipments in all were made, two of 46 tons of cobalt ore, which realized \$3289, and one of 24 tons, the silver content of which assayed 783.17 oz. per ton, the consignment, including other metallic contents, bringing \$9027. Under the circumstances it is no wonder the Government determined to sell the mine and was careful not to allow these details to become public.

WASHINGTON.

Alaskan Geological Surveys.—International Map.—Congress and Conservation.—Land Withdrawals.—German Potash Situation.

A. H. Brooks, of the Geological Survey, has just returned from Alaska and announces that while dry weather and other unfavorable conditions have curtailed the placer gold production at Nome, most of the other camps have either maintained or increased their output. It seems probable that the production for 1909 will be between nineteen and twenty million dollars. The low price of copper has not encouraged mining of that metal, but about half a dozen properties shipped ore during 1909. It appears probable that the Alaska copper output for the year will exceed four million pounds. In view of the recognized importance of Alaska's bituminous coal deposits, a detailed survey has been made of the Matanuska field. By the time this important field is reached by the Alaska Central railway, detailed information regarding the distribution and magnitude of the coal deposits will be available. The railway will also afford access to the Willow Creek district, where some quartz veins carrying high gold values were opened in 1908. "Railroad construction," said Mr. Brooks, in speaking of the Chitina copper precinct, "is being energetically pushed on the Copper River railway. Trains are now running 75 miles, and probably 25 more will be completed this fall. This road will connect the copper deposits of the Chitina with tide water on Prince William sound." Detailed geologic mapping of the best developed portion of this important copper district has been completed. A geologic party at Fairbanks has been engaged in the preliminary study of the newly discovered gold quartz of the region. "Although no large orebodies have been found," said Mr. Brooks, "some of the veins assay high and appear to be persistent. Pyrite, arsenopyrite, stibnite, sphalerite, galena, and free gold are found in a gangue of quartz. Prospectors report the occurrence of telluride ores, but specimens tested in the Survey laboratories show no evidence of tellurium. Veins from 1 in. to 12 ft. or more in thickness have been opened at about a dozen localities. Development is chiefly surface prospecting, but some deposits have been followed to a depth of nearly a hundred feet by shafts and tunnels. The indications are sufficiently encouraging to warrant more extensive prospecting." Two important pieces of exploratory work were accomplished, one in the region west of Cook Inlet and one over an area between the lower Yukon

and Seward Peninsula. The two largest lakes in Alaska have been surveyed, Lake Iliamna, about 100 miles long, and Lake Clark, a narrow lake about 50 miles in length. Copper and gold-bearing quartz and a little placer gold have been found in this region, but they have been but little developed. Exploratory surveys in the country lying between the Yukon and Norton bay show that the region extending eastward from longitude 161° holds out but little promise of containing valuable mineral deposits. To the west of this line, however, there are metamorphic rocks which may be auriferous. Geologic work was done by one party in the gold and copper regions of the eastern Kenai Peninsula and important information obtained concerning its geology, geography, and mineral deposits. Measurements of stream flow, in order to determine the quantity of water available for placer mining during the open season, were continued this year in the Fairbanks, Birch Creek, Hot Springs, and Rampart districts, and also in the various placer camps of the Seward Peninsula. Water-power plays an important part in the mining industry of southeastern Alaska. Its utilization will permit the mining of low-grade ores which cannot be commercially exploited by the use of coal. For this reason an engineer of the Water Resources Branch of



Map of Alaska.

the Survey visited this field in order to familiarize himself with the water problems involved and to obtain a basis on which to plan systematic work. Another party spent the summer in carrying reconnaissance surveys from the Yukon to the Koyukuk and thence to the Chandalar. The annual gold production of the Koyukuk among the Yukon camps is exceeded only by that of the Fairbanks. In accordance with the practice of making detailed surveys of the important mining districts, the geologic mapping and study of the ore deposits of the Berners Bay district was completed this summer. This district, though dormant at present, possesses some valuable lode quartz deposits. These surveys were also carried southward to the Eagle River district.

Bailey Willis and S. J. Kübel, of the United States Geological Survey, have started for London to take part in a conference regarding an international map on the scale of 1:1,000,000. The United States Geological Survey has for some time past been engaged in compiling maps of portions of the United States on this scale. The meeting is the result of a resolution presented at the Ninth International Geographic Congress held in Geneva in 1908 by Henry Gannett, of the United States Geological Survey, providing for the formation of an international committee to which should be intrusted the arrangement of details for a closer and more definite co-operation in the preparation of the proposed world-map. This resolution was adopted, and in conformity with its instructions, the British committee has invited the following countries to meet with it: Austria-Hungary, France, Germany, Italy, Japan, Russia, Spain, and the United States.

It is evident here that Congress will be asked by the President to formulate a definite national policy to govern the disposal of the public domain. Mr. Taft, it is understood, will come out in unmistakable language to the effect that the conservation of the minerals and land must be a

matter of law, not of executive action. He devoted a considerable portion of his annual message to this subject. In the meantime, R. A. Ballinger is preparing his first annual report as Secretary of the Interior. In it he will take occasion to reiterate his well known views on conservation and will recommend the passage of certain laws looking toward the protection of the rights of the whole people. Members of Congress are also taking a hand in this troublesome problem, and it is understood that a number of bills have already been drawn up so that they may be presented the opening day of Congress. The Public Lands Committees of both Houses will begin hearings on the subject as soon as Congress convenes. They have plenty of material to consider, for the bills introduced during the last session will come up for report. Among these are several calling for a complete revocation of all withdrawals of public lands. The most notable of these is that of Sylvester C. Smith, of Bakersfield, California, prohibiting the withdrawal of lands by the Executive without legislative sanction. Without waiting for decisive legislation, Mr. Ballinger has just withdrawn from public entry 8000 more acres of land in the States of Montana, Idaho, Colorado, Washington, and Wyoming, and the Territory of New Mexico. The land is thought to be valuable for water-power sites. It is located as follows: 634 acres on Rock creek, Montana; 1627 acres on Clark fork, in Montana and Idaho; 3584 acres on the Gunnison river and tributaries in Colorado and New Mexico; 1498 acres on the Klicitat river in Washington; 200 acres along the Judith river in Montana; and 712 acres along the Green river and tributaries in Wyoming.

Advices received here through the Consular Service are to the effect that the German Potash Syndicate members have quarreled and that the American farmers will benefit by reduced prices for their fertilizers. Owing to the extensive area of the potassium field, covering a considerable part of the Duchy of Brunswick, the province of Hanover, and extending into other States, new mining companies are established every year. When the competition of these companies becomes acute, they are admitted into the syndicate. At recent meetings of the syndicate the quota of a number of new companies was settled and they were admitted. Then arose dissensions as to the allowance to be made to each of the old companies, some of which had concluded contracts with American customers. There are two groups of these mines, one the Schmidtman group, consisting of the Aschersleben and of the Sollstadt mining works, representing what is called the North Trust. The other includes the International Agricultural Co., in the United States, and the Elnigkeitt Mining Works, with those of Westeregeln and Salzdetfurth, forming the South Trust, in the same country. On September 30 a final meeting of the syndicate took place and the proposition of the Schmidtman group for the syndicate to take over certain contracts with American companies for the delivery of 54,000 tons of pure potassium salts at half the prevailing price was rejected, and the syndicate broke up. The Schmidtman group withdrew and also the Elnigkeitt Mining Works. The Westeregeln and Salzdetfurth mines, which had hitherto acted in concert with Elnigkeitt, broke their union with that mine and have remained with the majority of the mines, numbering about fifty. These have resolved to form themselves into a new syndicate known as a 'Kampfsyndikat', or fighting trust.

SALT LAKE, UTAH.

Majestic Sinking. — Red Warrior Ore. — Chief Con. Production.

Alex. Moffett, general manager for the Majestic Mines Co., announces the arrival of the 300-gal. pump at the Harrington-Hickory shaft, and says that it has been installed. The flow of water is not heavy and the new pump keeps the mine drained with little effort. Sinking from the 500 to the 600-ft. level of the property has been begun. Some interesting development is expected. The drills have shown the existence of a much higher silver-lead ore in depth, and the engineers of the company take the view that the richest deposits will come in above the sulphide ore.

The opening of this mine will have a great effect on the future of the Star district. Its workings are the deepest in that district, and a large tonnage of shipping ore has been developed between the third and fifth levels. Since the pump has been installed the management is preparing to make regular consignments of ore to the Salt Lake smelters. From this extraction the company will be able to show a profit above its operating cost.

Sioux Consolidated reduced its regular monthly dividend from 7 to 3c. per share. Its dividend now amounts to \$22,500, and will not be increased until more high-grade ore is opened. Most all of the first-class product to the 400-ft. level has been extracted. The Colorado posted its regular dividend of 8c. per share, aggregating \$80,000. Iron Blossom re-entered the dividend paying division by paying 8c. per share to shareholders, the total distribution amounting to \$79,200. This company has one of the largest estates in the Tintic district. The main working shaft has been sunk 1300 ft., and drifts are being sent from this and the 1100-ft. level to get under the rich deposit that has been opened off the south shaft at a depth of 335 ft. J. Will Knight, the new manager of the mine, says they may decide to continue the shaft to a depth of 2000 ft. should they find the ore continuous. A second deposit of sand carbonates has been opened in the Red Warrior mine. At a point about 60 ft. south from the shaft on the 400-ft. level the orebody has widened, and over 6 ft. of high-grade silver-lead is being mined. The company is making a nice profit on this and is opening other portions of the ore deposit. Driving to the north from this level has opened the ore for a distance of 75 ft. After the ore has been blocked out on this level, the management will sink a winze. Lucien Merritt, president of the company, is visiting the mine, and before his return to his home in Duluth will give orders to have the forces increased and the property opened extensively. The ore being marketed averages \$20 per ton.

Walter Fitch, president of the Chief Consolidated Mining Co., which has a large group of claims in the town of Eureka, reports things in excellent condition. During October he shipped ore that netted the company \$7316, while the November shipments to date will net \$10,000 more. A 50-ton car of ore is forwarded daily. It nets \$25 per ton. The main working shaft has attained a depth of over 2000 ft., and a higher grade of silver, lead, and copper ores occur in the lowest workings. The company is controlled by Boston people. Earnings are expected to become \$50,000 per month within a short time. The mine is in Tintic and adjoins the Centennial-Eureka, owned by the United States Smelting Co. When Walter Fitch was general manager of the United States company properties, he conceived the idea that the Chief ground was valuable. Accordingly he resigned his position and has since devoted himself to the development of the new property. William H. Hatfield, general manager of the Ophongo mine, in Tintic, says that they will increase the shipments from two to three cars per week. This mine was opened only a few months ago. Permission was secured from the Black Jack company to drive a drift from the 300-ft. level into Ophongo ground. A fissure bearing ore was discovered, and the management has opened this ore for a distance of 40 ft. Fourteen mine-cars taken out a few days ago showed ore of an average of 20% copper. Work will soon be started on a new adit which this company will drive on its own ground to cut the fissure at greater depth. With this work completed the management will install a hoist in the adit and sink a winze on the ore.

The inspection recently made by the Utah Copper directors and officers of the mine at Bingham and the mill at Garfield is viewed with a great deal of significance. While this is the regular annual inspection of these properties, one of the subjects under consideration was the recommendation made by D. C. Jackling to add to the present capacity of the mill plant at Garfield. This reduction works is now treating 6000 tons of ore per day, and the new plans, provided they are adopted, will call for an additional capacity of 3000 tons. The new equipment is to be the same as that in operation in the main plant, with the Chilean crushers and vanner tables.

GOLDFIELD, NEVADA.**Production. — Consolidated Development. — Combination Fraction.**

Ore production in the Goldfield district is maintained at a figure varying from \$215,000 to \$235,000 per week, an amount considerably below the normal, owing to the abandonment of the Combination mill, the additional changes in the Florence mill, and the cessation of operations at the Daisy. A new gyratory crusher has been installed in the Florence mill which will hereafter treat 160 to 170 tons per day, and by December 15 the Consolidated, with the aid of six Chilean mills to be installed soon, will be treating 850 to 900 tons per day. The old Combination mill is being dismantled and portions of the woodwork, with which the ore in various steps of the process of reduction has come in contact, have been burned and many thousands of dollars worth of gold recovered from the ashes. In the burning of this wood, a furnace without draft was used in order to prevent loss of the finer particles of gold. The quarterly meeting of directors of the Consolidated Mines Co. was held in Goldfield, November 18, a week earlier in the month than usual, in order that the Eastern directors might return to their homes in time for Thanksgiving. In addition to the regular quarterly dividend of 30c. per share, an extra of 20c. payable January 31, was declared. After payment of these dividends \$1,000,000 will remain in the treasury. J. H. Mackenzie resigned as general manager, and J. R. Finlay was elected to be his successor. Before the end of the year a drift at the 1000-ft. level of the Clermont shaft should reach the vein, which has proved of such vast magnitude and richness at the 860 and 730-ft. levels. The cross-cut at the 1000-ft. level is being driven to the west, toward the Mohawk vein, and the dip of the ore-shoot opened above is toward the shaft. At the upper levels the walls are well defined and regular in direction, the vein trending northeast. At the 860-ft. level the vein is 20 ft. wide and composed of good milling ore. Preparations are now being made to open stopes at this level, from which a considerable tonnage has already been taken in the course of development. Raises are being driven from the 730-ft. level to connect with the workings at the 600-ft. level. One raise has already been completed, and another will shortly be started to connect with the drifts from the bottom of the 50-ft. winze below the 600-ft. level at the south and near the boundary line of the Mohawk and Jumbo. In these drifts large bodies of excellent milling ore have been opened, and near this point a large production is being made from the stopes opened between the 450 and 600-ft. levels. Northwest from the Clermont shaft the 600-ft. lateral has entered the Red Top vein on the Lucky Boy claim and driving is in progress both ways in good ore. A force of miners is still searching for the body of Matt, the remaining victim of the Hampton stope cave. The remains of his companion were recovered recently, crushed between timbers under many tons of caved earth. The Consolidated mill has been treating 650 tons per day and the mill-heads averaging from \$25 to \$35 per ton, with a recovery of about 94 per cent.

No definite information has been obtainable regarding the plans for the future of the Combination Fraction company. Operations at the mine have been confined to cleaning up the ore already broken, and no ore has been treated by the leased mill, although the sampling department of the plant has been in use by the company owning it. Officials of the Fraction company have always been reticent with regard to the orebodies and production, but in an interview only three weeks ago H. S. Stark, the general manager and consulting engineer, declared that good progress was being made, the mill treating 80 tons per day of \$30 ore with excellent prospects for the continuation of profitable mining. The manager stated that in August last, shipments of 100 tons of the best class of ore found in the mine were made to smelters as an experiment, but that the costs of transportation and smelter tolls were so high that it was determined to treat the entire product of the mine in the 20-stamp leased mill. Some time prior to this interview I was assured by officials of the company that monthly net earnings of from \$40,000 to \$45,000 could be relied upon, and on November 5 the Fraction company paid its first divi-

dend of 10c. per share, or about \$93,000, and the announcement was made after the meeting at which the dividend was declared that the company would retain in its treasury a surplus of over \$100,000, but the mill, now closed, with the break of the stock, is creating much unfavorable comment. The statement that the mill is closed temporarily only does not convince, since it is the usual announcement in such cases. George Wingfield, president and owner of the majority of the stock, is absent.

MEXICO.**Pachuca Changes. — Mining Law. — Guanajuato Improvements.**

Pachuca is still in the lime light awaiting the verdict of the Camp Bird, Ltd., with regard to the Santa Gertrudis. At the London Board meeting of the Camp Bird company, the chairman, A. M. Grenfell, stated that: "The net revenue for the year carried forward to profit and loss account was £320,000"; he also stated that as soon as the final report was received from Mr. Frecheville they would call the shareholders together and submit a financial plan, and it was their desire to so arrange matters that the whole of the profit of the new mine would be available for the Camp Bird company. E. P. Merrill, until lately managing director of the Real del Monte Co., at Pachuca, has just retired and C. W. Van Law has taken his place. The appointment was made November 1. Mr. Van Law was for five years general manager for the Guanajuato Reduc-

**Santa Gertrudis Patio, Pachuca.**

tion & Mining Co., but since last January has been consulting engineer for the Guggenheims at their New York office. Robert H. Lyman will continue as assistant general manager for the Real del Monte at Pachuca. In view of the open bids made for Pachuca tanks recently by manufacturers without license from the patentees, it is interesting to note that the Cia. Beneficiadora de San Francisco have discarded these bids and have placed their order for three additional tanks with the owners of the patent, Grothe & Carter, of Mexico City. Two other orders have also been placed, notwithstanding competitive bids. This looks as though these mining companies recognize the patentees' claims, and are willing to pay royalties rather than run the risk of a lawsuit with its attendant loss of time.

The second reading of the bill for the new mining law was recently held in the Senate, and the discussion that has followed does not seem to indicate that any changes of importance will be made from the draft that was passed by the Lower House, and it seems probable that next week the bill will be finally read and voted on, article by article. It will then become law, to take effect January 1910. An immense aerolite was seen to fall near Lagunillas in the State of San Luis Potosí, and a search party, consisting of a corps of students, is to be sent out by the Instituto Geológico to find it. Those who saw it state that it was very brilliant, the flash of light being several metres in diameter. Mexico already possesses two of the largest meteorites ever found.

The Guanajuato Amalgamated Gold Mines Co., which

owns the Jesus Maria, Providencia, Sangre de Cristo, and other mines in the La Luz camp of Guanajuato, was recently in difficulties and in the hands of a receiver. William H. Puffer was appointed manager and as a result of better and more economical organization and closer saving in the mill, he has been able to pull the company out of its difficulties, the net return per month now amounts to about \$20,000, with the result that arrangements have been made with the creditors and the receiver has been dispensed with. The mill is equipped with 100 stamps, concentrators, and a cyanide plant; a filter plant will be added soon. At present milling from old dumps only is being done. These contain about 300,000 tons of ore. The Guanajuato Consolidated Mining & Milling Co. is now giving net returns of over \$50,000 per month. The company also controls the Carmen-Guanajuato Gold Mining Co., which recently erected a small but complete milling plant having a capacity of about 50 tons per day. This plant is equipped with rock crushers, stamps, concentrators, tube-mills, and a cyanide plant, the whole being electrically driven. The Guanajuato Reduction & Mines Co. has built an electric tramway to transport ore from the old Mellado and Rayas dumps to the mill. Plans are being made to open up the old mines.

The San Miguel Gold Mining Co., a Pittsburg concern, which owns some 400 pertenencias of gold-quartz properties in the Yaqui district of Sonora, has not developed on a large scale during the last few years owing to the Yaqui trouble. Since that is now settled, the company is pushing work actively. A stamp-mill with amalgamation and concentrators, with a capacity of 30 tons per day is being erected. It is expected that milling operations will commence in January.

NEW YORK.

Industrial Activity.—Copper Surplus Decreasing.—Mine Sales.

A new era of constructive enterprises seems to be at hand. The talk of the formation of the copper 'trust' seems to have cleared the atmosphere of all doubt that the panic is over. Second only in importance to the copper combination is the purchase of the control of the Western Union Telegraph Co. by the American Telephone & Telegraph Co. It is thought that the Postal Telegraph Co. will come into or be forced into the new combine. The Wells Fargo Express Co. is to declare a dividend of 300% and increase its capital from eight to twenty-four millions.

The news of the week has been all copper. Many stocks have sold up to new high records in local markets. Amalgamated has been the leader and the entire list of coppers has been exceedingly active at prices much higher than ruled thirty days ago. By no means all of the activity has been limited to the share market. Metals also have been active and the last few days have seen buying in large amount. Sales of some sixty millions of pounds of copper have been reported this week, and it is quite evident the bugaboo of a surplus is to be finally routed. Fractional advances in price to 13¼ and 13½c. are reported, and the long looked for 14c. copper market may be nearer at hand than was thought possible a few weeks ago.

The directors of the Development Company of America have announced that they have bought for the company, the properties of the Saddle Mountain Mining Co., in the Christmas district between Kelvin and Globe, Arizona. They have also obtained an interest in the properties of the London-Arizona Co., controlled by Charles E. Finney. The Development Company of America numbers among its directors, Frank Murphy, president of the Phoenix & Eastern railway, a feeder of the Santa Fe system; B. P. Cheney, a director on the Santa Fe, and other prominent men of like calibre. The Cactus Development Co., which has options on the ground of the Arizona National Copper Co., near Globe, Arizona, is expected to exercise its options about January 1. The Cactus is controlled by Boston and Duluth people, several of the directors of the Calumet & Hecla being interested. The Cactus enterprise is an especially interesting one and fraught with much importance to the copper world, because it marks the first real plunge of the conservative Calumet & Hecla crowd into the Arizona copper fields.

The Utah Copper crowd is said to have taken an option on a controlling interest in the Ohio Copper Co. If the option is exercised the new combine probably will have entire control of the Bingham camp, as in addition to Utah Copper and Ohio, both Boston Con. and Utah Con. are said to be marked for inclusion. The Hedley Gold Mining Co. is experimenting with its 40-stamp mill with a view to reducing tailing losses. The property is a gold mine in British Columbia and was taken over by the present company from an exploration syndicate made up of United States Steel Corporation officials and a group of capitalists who are prominent in the Cole-Ryan enterprises. A mining engineer of New York, who is quite heavily interested in the negotiations now pending for the purchase of the Santa Gertrudis y Guadalupe by the Camp Bird, Ltd., says that he has good reason to believe that the deal is to be consummated. The same authority states that the El Oro people expect to exercise their option on the La Blanca, which option the Camp Bird was supposed at one time to have secured.

BUTTE, MONTANA.

Re-Organization of Amalgamated Subsidiaries.—Sale of Stores and Hotels.—Development of Right Bower.

A re-organization of the Amalgamated subsidiaries is under way to establish a basis for the exchange of stock in the big merger of copper interests that is forming. The lumber interests of the Amalgamated have been incorporated in a concern called the Big Blackfoot Lumber Co., capitalized for \$25,000,000. The company succeeds the Big Blackfoot Milling Co., which is capitalized for \$1,000,000, of which \$700,000 only has been issued. The lumber business of the Amalgamated outgrew this capitalization long ago. It is said that the actual value of the property in the new corporation will inventory between \$40,000,000 and \$50,000,000. The charter under which the new company is incorporated is broad. The directors are all Amalgamated officials—John Gillie, Roy S. Alley, C. F. Kelley, H. A. Gallwey, and L. O. Evans, all of Butte. Mr. Kelley, who is chief counsel of the Amalgamated company, has been in New York for some time in consultation with higher officials relative to the organization of the copper merger. It is likely that other interests of the Amalgamated company, now in low capitalized companies, will be re-organized and put into larger companies. This will probably be true of the coal interests especially, which are said to be worth fully \$50,000,000. While the Amalgamated has been re-organizing some of its interests, such as are closely identified with mining, it has also gradually got rid of others that have not been necessary to mining. All of its mercantile and hotel business has now been sold. The company once owned large department stores at Butte, Anaconda, Missoula, Hamilton, and elsewhere, and in taking over the interests of the late Marcus Daly it acquired hotel properties at Anaconda and Hamilton, which have also been sold. It has been the recent policy of the Amalgamated to confine the work to mining and kindred industries and to leave the mercantile and hotel business to others. The fact that the company maintained such establishments in rivalry with private individuals and small companies has always stirred up much feeling against the big company.

The Anaconda Copper Mining Co. is developing another big mine in the Butte district, called the Right Bower. It is situated on Anaconda hill, just east of the Butte-Ballaklava mine. When the latter opened three or four big and rich copper veins the Anaconda company concluded that the Right Bower, which carries the extensions of some of the Butte-Ballaklava veins, was worth exploring. A shaft has been sunk to a depth of 600 ft., the greatest depth allowed by the laws of the State without a connection with another outlet, and a level opened into the Mountain Chief mine, another Anaconda property. Three large veins, 6 to 15 ft. wide, were found in this level. The connection with the Mountain Chief workings has been completed, and driving is being done on the veins. The ore taken out in the course of development is of high grade, and the miners say the Right Bower will develop in a rich mine.

General Mining News.

ARIZONA.

COCHISE COUNTY.

On the Reider claim, in the Paradise district, the shaft is down 60 ft. on the vein, the ore averaging 4% copper. —The California & Paradise company, which recently took over the Leadville group, is to install a power plant, hoist, and No. 5 Cameron sinking pump.

GILA COUNTY.

A recent shipment of five tons from the Monte Christo group, in the Copper Hill district, assayed 17½% copper with 25 oz. silver per ton. The claims adjoin the property of the Arizona-Michigan Mining Co., and are under lease to John Sherwin. —Between 40 and 50 tons per month of silver ore, with a small amount of copper, is being shipped from the Centennial group, six miles east of Globe, to the Old Dominion smelter, by W. M. Davis and Harry Zschoegner, the lessees. The ore is being mined from a stope opened near the bottom of the winze sunk from the drift on the 300-ft. level. —Both cross-cuts on the 500-ft. level of the Telfair shaft of the Arizona-Michigan property are in a hard diorite. The company is doing considerable work on the Blackbird, Defender, and Old Dominion claims. S. W. Clawson is manager. —The Cordova company, in the Miami district, has started a shaft on the line between the Jennie and Osceola claims, about 250 ft. from a drill-hole on the Inspiration group, that passed through 200 ft. of concentrating ore.

MARICOPA COUNTY.

The Vulture mine, situated southwest of Wickenburg, from which point supplies are hauled by wagon, has been famous since 1863, and is reputed to have produced \$16,000,000. It had been idle for several years, but in 1908 was taken over by the Vulture Mines Co., and W. Spencer Hutchinson placed in charge of the work. Five bulletins have been issued since the new work has taken up. These relate that the old shaft was found in good condition, that a local water supply has been found, oil adopted for fuel, and distillate engines installed, 2513 ft. of development accomplished, 20 stamps of the old mill put to work, and important ore reserves established. It is stated that the output of the present mill will meet operating expenses, and that an average of \$11 per ton has been maintained without touching ore reserves. A new mill is being planned.

MOHAVE COUNTY.

A. J. Sayle, consulting engineer at the Giroux mine, near Ely, who was sent into the new districts near Bill Williams Fork to report on some prospects for the Amalgamated interests, was impressed so favorably with the general showing of the entire district that he not only at once secured the property in question, but located 20 additional claims for himself and associates. —At the Ruth mine, in the San Francisco district, the faulted vein was found in a cross-cut on the 100-ft. west drift 45 ft. from the shaft. Two feet of the portion of the ore already cut are said to assay over \$100 per ton. —The South Gold Roads group of three claims, owned by E. A. Shaw and associates, has been bonded by a company of Indianapolis men. The group adjoins the Gold Road mine and some good ore has been found on the ground. —In the Carter mine sinking has been resumed in the shaft and will be continued to the 260-ft. level. —J. H. DeWaide, of Oklahoma, and S. R. Porter, of Los Angeles, visited Mineral Park where they have a force of men at work in the Keystone mine. It has been decided to equip the mine with steam hoist and drills. —The Tennessee mine, at Chloride, owned by James H. Hurin and associates, has been bonded by L. D. Godshall, manager of the Needles smelter, presumably for the United States Smelting & Refining Co., for which he has made all his recent purchases. —At the Eureka mine in the new Walnut Creek camp, five miles east from Drake, on the main line of the Santa Fe, and about ten miles from Kingman, L. M. Worton, the manager, is installing a pump, hoist, and air-drills preparatory to sinking 200 ft. from the

present 50-ft. level. —Louis Lusk and C. A. Cobb, of Spokane, have just purchased five claims between Walnut creek and the Bi-Metal mine, and have started work under the direction of A. J. Hamme. —At the annual territorial fair at Phoenix first place for the best all round mineral exhibit was awarded Mohave county.

PIMA COUNTY.

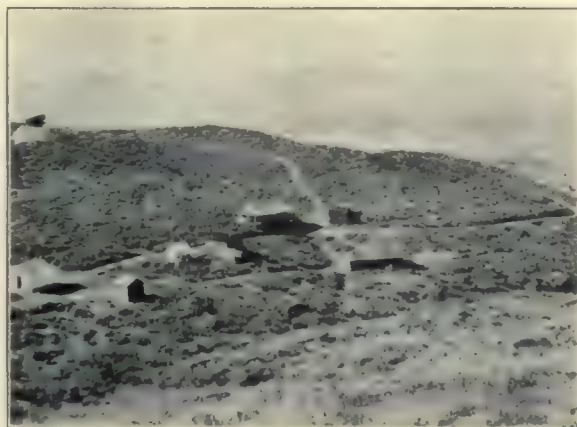
A 4-ft. vein of high-grade ore has been found on the property of Dan Johnson, west of Greaterville, in the Santa Rita mountains. About 300 ft. of development work has been done on the group.

PINAL COUNTY.

The Santa Rosa group, east of Silverbell, has been bonded to Albert C. Wandel and associates of Nevada. There are 25 claims in the group on which a 100-ft. shaft has been sunk opening some good copper ore. The new operators will take over the property and commence development at once.

YAVAPAI COUNTY.

At the Shylock mine, six miles east of Dewey, complete electrical equipment has been installed and a force of men put to work cleaning out the main shaft preparatory to sinking. At present it is down 610 ft. and the company plans to sink to the 1000-ft. level and cross-cut the ore which on the upper levels has been from 35 to 50 ft. thick.



Bradshaw Mountains, Arizona.

—E. T. Taylor and H. P. Dyson have purchased the interest of N. J. Griffin in the Capitol North claim, in the Walker district. Several runs of the ore have been made in the Pine Mountain mill with satisfactory results. —A rich shoot was opened in the Zero North mine, south of Prescott, by John Quelico, who is operating the property under lease. The ore was opened by a drift being run on the old Zero vein when in 280 ft., giving 175 ft. vertical depth. The mine is credited with a production of \$40,000 worth of gold and silver ore though opened only to a depth of 200 feet.

YUMA COUNTY.

At the Blue Bell mine, near Swansea, the company has 200 tons of \$25 ore on the dump, with a large amount of similar material blocked out in the mine. —All the wood work in the smelter at Swansea is being replaced by structural steel, and the work of enlarging the plant to a capacity of 700 tons per day will be under way in a short time.

CALIFORNIA.

CALAVERAS COUNTY.

The adit on the property of D. Porteous, at West Point, cut some excellent ore. —At the Crown Point mine the drift is being driven on a 3-ft. vein that assays from \$6 to \$8 per ton. —There are 40 tons of high-grade ore on the dump of the Bouvard Extension mine, operated by Smith & Thompson. —J. Sterling & Co., have erected cyanide tanks in the canyon below the old Jenkins mill and will treat the old tailing. —At the Yellow Aster mine, Congdon & Carlton have cleaned out No. 2 adit and resumed work there.

—High-grade ore has been opened by a shaft at the M. R. G. mine at a depth of 40 feet.

MARIPOSA COUNTY.

A new steam hoist has been installed at the Long Mary mine.—Operations have been resumed by lessees at the French Camp mine.—John Hanna, C. P. Pratt, and J. W. Pratt, have secured a lease on the Buckeye mine, and commenced operations at the property.

NEVADA COUNTY.

A. P. Wilson, the superintendent of the Prudential mine, near Grass Valley, is authority for the statement that the company will sink the shaft an additional 200 ft. on account of the discovery made at the mine a short time ago. A new cable will be purchased and sinking resumed before the first of December.—A new compressor and gasoline engine has been ordered for the Grover-Murphy mine, in the Nevada City district, and sinking will be resumed at the 250-ft. level. A cross-cut will also be started from this point to open the ore, which is thought to be the extension of the Mountaineer vein. Harry B. Gray is manager.—The raise from the south drift on the 900-ft. level of the Oustomah mine, opened a 10-in. vein of high-grade ore. Considerable free gold is present as well as zinc and galena. The raise is under the old Eddy workings, and is in unprospected ground. Frank M. Evans is superintendent.

SACRAMENTO COUNTY.

The committee appointed last July to investigate the condition of dredge mining on the American, Yuba, and Feather rivers, reported as follows: In regard to the actual dredge operations we find: 1. That the dredge operations on the American river are being conducted on lines and in such a manner that no injury to that stream is resulting therefrom. 2. That we commend the work of the dredges operating on the Yuba river under the direction of the California Débris Commission as the proper manner of dredging California streams, in that the tailing is removed from the flood action of the river, and the river itself is confined to its proper width, thereby securing the current necessary to insure proper depth of stream and the impounding of untold quantities of hydraulic tailing that would eventually find its way to the Feather and Sacramento rivers. 3. That the dredge operations on the Feather river, below Oroville, have been without system or organization; that the present operations are tending to greatly increase the flood plane of the river and great damage has resulted to the stream and the country adjacent thereto; and we recommend that the California Débris Commission assume control of the operations on this river, and institute a policy of rectification that will have for its object the improvement of the river, the lowering of the flood plane, and the control of its flood waters.

SHASTA COUNTY.

At the last meeting of the Shasta County Farmers' Protective Association, the executive committee recommended that Judge Marshall's modified decree be made the basis of an agreement in the settlement of the smoke question between the association and the smelting companies. In order to make the agreement binding for all parties it will be necessary to have a court decision, so a friendly suit will be brought, the details of which will be arranged between the lawyers of both parties.—George A. Von Kruse, the superintendent of the Sibil mine, in French gulch, has refused to turn over the Sibil claim to Charles O. Rose, trustee for the bondholders, who purchased the property recently at a court sale, on the ground that the assessment work was not performed and the claim located by his associates.

SIERRA COUNTY.

Some excellent gravel is being opened on the claims of Wendell Kallenberger, on Wolf creek, below the Plumbago mine.—The Sierra Porman, Bixby Consolidated, and Kate Hardy mines have been shut down for the winter on account of the recent heavy snow.—Frye & Winrod have brought 1600 lb. of rich concentrate from their property in Sailor ravine to Downieville, and are preparing to ship it to the Selby smelter.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—A streak of ore 6 in. wide was cut last week in the breast of the Rochester adit on the Bellevue vein that assays 1030 oz. silver and 1.50 oz. gold per ton.—In prospecting an old stope on the Key West property, Leavenworth mountain, E. J. Butts discovered a streak of ore that is 8 in. wide, and assays 42% zinc, 15 oz. silver, and 0.10 oz. gold per ton.—The chemical laboratory at the new chemical-electro plant has been completed and the equipment is now being placed in position. S. Iodenes, the chemist, will start sampling ore in a few days.—A streak of ore 6 in. wide has just been cut by the raise from the Victoria adit level on the Frostberg vein that assays 320 oz. silver per ton and 40% lead. B. J. Martelon, of Denver, is manager.—During the last ten days the water in the Seven-Thirty shaft has been lowered over 70 ft. Owing to the pressure from above the drill-holes are becoming larger, and at the rate water is flowing the entire seven miles of underground workings will be drained inside 30 days.—A shipment of iron concentrate made last week from the Capital mines brought a settlement of \$34 per ton of gold. This is an increase of \$20 over that previously received.

Georgetown, November 19.

(Special Correspondence).—The Burns-Moore adit has intersected another vein at a distance of 4000 ft. from the portal. The heading of this bore is just penetrating the rich section of Chicago mountain, and within the next 1000 ft. a number of former heavy producing mines will be intersected at depth. W. W. Cannady is manager.—At the Lamartine mine a force of 20 men is being employed in the various leases and heavy shipments are being maintained. All work is being carried forward through the main adit level. The concentrating plant which has been handling dump-matter during the summer, has been closed owing to the lack of water. John Lang is manager.—At the Earl Kent mine, at Dumont, owned by W. P. Alkire, there is exposed in the adit an orebody that is from two to three feet wide that assays \$16 per ton.—O. Jaensen has been awarded a contract to drive the Adduddel lateral from the Newhouse tunnel a distance of 500 ft. This work is being performed by the Druid Mining Co., and is destined eventually to connect with the shaft of the Hazelton mine, where sinking has been in progress for several months past.—During the month of October the Newhouse tunnel was driven 215 ft. A strong water-course was cut during the month and as a result the flow from the tunnel has been almost doubled. A short distance from the present breast large switch and side-track accommodations have been blasted out. The owners of the Gardener property which was recently intersected, have called for bids for the driving of a lateral upon that vein.

Idaho Springs, November 20.

GILPIN COUNTY.

(Special Correspondence).—Lowe & Harris, operating the Rockford property in the Russell district, have awarded a contract to Hugh Williams for the sinking of the shaft 100 ft. The contract also provides for 100 ft. of driving. A new building and steam plant has just been placed in position. The shaft is now down 140 ft., ore having been produced from surface.—The shaft at the German mine has been cleaned and re-timbered to a depth of 300 ft. Drifts have been started on the 120-ft. level. R. Miller is in charge.—The 150-ft. shaft at the Gomer mine in the Russell district is to be sunk another 100 ft. A. A. Johnson, of Denver, is manager.—R. I. Hughes, of Russell gulch, who recently obtained a bond and lease on the Hughes mine on Bellevue mountain, has put work under way and at an early date shipments of both smelting and concentrating ore will be started.—Work has been resumed at the Argo mine, in Russell gulch, by the Argo Leasing Co. Harry Willis is manager.—A 6-in. streak of 4-oz. gold-bearing ore has been opened in the east 150 and 250-ft. levels of the Champion mine, in the Phoenix district. George Ross is manager.—The Polar Star mill, at Black Hawk, has been undergoing repairs during the last week.

This is a custom plant and a number of operators are sending heavy shipments. Theodore Nelson is operator.—A force of men is being employed in cleaning up around the pyritic smelter at Golden, preparatory to blowing-in the furnaces.—A streak of \$100 ore from 6 to 18 in. wide has been opened in the Gold Collar mine in a new stope that has been started above the 300-ft. level. Alfred Skeels is manager.

Central City, November 20.

LAKE COUNTY.

George F. Champion and associates have made arrangements for the resumption of work in the Little Bob mine and a portion of the workings of the Fanny Rawlings property in the Leadville district. A cross-cut will be started on the 350-ft. level and driven west through the Fanny Rawlings ground to open the orebody found in the St. Louis adit.—The Yak tunnel has cut a water course that is now draining the Resurrection No. 2 shaft, and it is expected that the workings will be free of water in a few weeks. A raise will be started to connect with the shaft as soon as the water is lowered. Considerable prospecting is being done on the Adelaide and Belgian-Frenchman claims through the tunnel.—The Saguache adit, west of Leadville, is now in over 500 ft. and the company is planning to install electrical equipment.—A portion of the Big Six ground is being worked through one of the Penn shafts. A 450-ft. drift has been run on the 600-ft. level opening several seams of high-grade ore.

OURAY COUNTY.

John Keleher, operating a lease on the shaft-workings of the El Mahdi mine, north of Ouray, has opened several streaks of silver ore. Two additional leases have been let on the property and considerable prospecting is being carried on.—A contract has been let to sink the shaft of the Congress mine, at Red Mountain, an additional 200 ft. This is now down 300 ft. and the contract calls for cross-cuts being driven to the vein on the 400 and 500-ft. levels.—John Gianino, operating the Mountain Lion mine, near Ironton under lease, shipped a car of ore from the property last week.

SAN JUAN COUNTY.

A body of ore assaying \$20 across the face has been found in the Champion mine at Silverton. A deep adit was driven to open the mine at depth, and when in 1950 ft. cut a 4-ft. vein. Drifts were started in both directions on this, and when in 75 ft., the south drift opened the ore which contains gold, silver, and lead, with a small percentage of copper.—John S. Fox has purchased the interest of John W. Essley, his partner, in the Alhambra group, near Animas Forks, and will thoroughly prospect the property.

SUMMIT COUNTY.

Twenty cars of ore were shipped from the Wellington mine recently and it is understood that the output is to be increased.—The Country Boy shipped 11 cars of zinc ore during the past month.—The management is shipping one car of ore per day from the Sallie Barber mine, in the Breckenridge district. Ten cars of high-grade zinc ore were forwarded to the smelter recently.

TELLER COUNTY.

Owing to a fall of rock in the Cookerly sublease on the Prince Albert ground, the output was cut down to one car per day of ore assaying \$12 per ton. The Union Leasing Co., holding the original lease on the property, has resumed work in the main adit and is driving east to open the Cookerly and Wilhelm shoots.—Three prospecting permits have been granted on the Kalamazoo and Little Joe claims of the Alert Gold Mining Co.—The Alabama Gold Mining & Leasing Co. was incorporated in Cripple Creek to operate a lease on the property of the Ajax Gold Mining Co., on Battle mountain.—Bunch & McNamee, operating a lease on the Burns mine of the Acacia Gold Mining Co., have opened a shoot of ore on the fourth level that assays between \$15 and \$30 per ton, and are shipping six cars per month.—J. E. Jones and associates, leasing the old C. O. D. mine in Poverty gulch, recently made a shipment of ore mined near the collar of the

incline shaft that assayed about \$25 per ton. Considerable prospecting work is being done in the mine and shipments will be made regularly in the future.

IDAHO.

SHOSHONE COUNTY.

(Special Correspondence).—The Caledonia Mining Co. is shipping 300 tons per month of lead-silver-copper ore from its group of six claims near Wardner. The mine is opened by a 500-ft. incline shaft in the quartzite foot-wall, with drifts on the vein from the 300 and 500-ft. stations. The vein is from 7 to 50 ft. wide. The first-grade ore contains from 30 to 60% lead, 2 oz. silver to each unit of lead, and 3 to 6% copper. The net return on one car of 30 tons was \$5000, and the shipments are incidental to development. Electric power is used in hoisting, and drilling is done by hand, but an air-compressor for power-drills is to be installed soon. There are about 45 men on the pay-roll. Charles McKinnis is manager for the company.—The National Copper Mining Co. has claims one mile west from the Snowstorm, near Mullan, containing a well defined vein, to open which a 4500-ft. cross-cut is being driven that will give 1700-ft. depth on the vein.—The Lucky Calumet joins the National on the east, and a long cross-cut being driven to its ore zone will give similar depth. This property is in charge of John H. Nordquist of Wallace.—The Ivanhoe company is driving from the Star workings to open the ore on its own property. These two lie west from the Morning mine.—The Snowshoe, which adjoins the Snowstorm, is under lease to George Houston and associates.—A contract has been let by B. M. Francis, of the Rex, on Nine Mile, for 500 ft. of sinking. The Rex has the requisite equipment for this work.

Wardner, November 20.

MONTANA.

SILVER BOW COUNTY.

(Special Correspondence).—The Butte-Ballaklava is raising the third compartment of its shaft from the 500-ft. level to the surface, and mining on the 300, making regular shipments of ore. A new steel head-frame is also being erected. The orebodies are sufficiently opened for a production of fully 10,000,000 lb. of copper per year.—The Butte Coalition company, whose stock has had a period of activity recently for the first time in several years, is gradually increasing its production and is now mining about 2000 tons of ore per day, and is producing copper at the rate of about 45,000,000 lb. per year.—F. A. Heinze has begun repairs at the Basin concentrator, owned by La France Copper company, and it is understood that Davis-Daly ore from the Colorado mine will be handled there.—Robert H. Gross and James H. Reed have completed their examination of the properties and affairs of the East Butte Copper Mining Co., and both are very well satisfied. Before leaving for Boston Mr. Gross said the East Butte was now the largest independent copper producing company operating in the Butte district, its production at present being in excess of 7,000,000 lb. per year.—There is another mystery working in the British-Butte Mining Co. The big dredge, which has been working on some placer beds a few miles west of Butte, has again been shut down, and the company is at present without a local manager. Manuel H. De Hora had been manager for the company up to a few months ago, when he was called to London. Upon his arrival there a cablegram came to Butte stating that he had resigned and would not return. Norman Jenks, son of one of the London stockholders of the company, remained as manager for a month, and then word came that Mr. De Hora was on his way to Butte, whereupon Mr. Jenks shut down the dredge, and hastily started for London. Before his departure, Mr. Jenks had let a contract for development and exploration work by means of drills, which seems to indicate anything but a satisfactory condition.

Butte, November 20.

NEVADA.

CLARK COUNTY.

The winze on the 170-ft. level of the New Year's Gift lease, at Searchlight, opened 2½ ft. of \$40 ore when down

26 ft. The shaft will be sunk to the 250-ft. level, a cross-cut run to the vein, and a drift driven to connect with the winze.—Cook, Chase & Zook, shipped 100 tons of ore from the I. X. L. lease to the Cyrus Noble mill, although a contract had been made with E. J. Knight, who is erecting a custom plant. A blacksmith shop and ore-bins have been erected near the portal of the adit.—There are 40 sacks of ore on the dump at the Morel lease, on the Good Hope property, that assays from \$23 to \$73 per ton. The ore occurs in small stringers and the ground is pockety. E. E. Perkins is in charge of the work.—Sinking has been resumed at the 300-ft. level of the Lenape property and it is the intention of the company to continue to the 1000-ft. point.—The White Rock Mining Co., operating 25 miles southeast of Searchlight, has built a wagon-road to the property and installed a 50-hp. engine, compressor, and machine-drills. A new adit has been started that will cut the vein at a depth of 100 feet.

ESMERALDA COUNTY.

Philadelphia operators who are sinking the old Goldfield Annex shaft on the Poleverde claim has found a strong vein at the 600-ft. level that is believed to be the extension of the Clermont. The work is but a short distance from the Consolidated's Clermont shaft, and the vein will be explored at this depth while the shaft is continued to 1000 ft.—At the 625-ft. level the shaft of the Precious Metals Co.'s lease on the Atlanta is in vein matter. It is thought to be the St. Ives vein, from which high-grade ore has been taken on the adjoining claims.—Driving is in progress from the shaft of the Fairview Cherokee lease on the Atlanta at the 640-ft. level, where the vein was opened from which good assays were secured above the 500-ft. level.—A favorable showing is being made on the Velvet claim of the Merger Mines Co., where William MacKay and associates are working both the company shaft and the St. Ives.—Work has been resumed on the old Chicago Florence, originally a sub-lease from the Rogers Syndicate lease, south of the Florence hill. The 425-ft. shaft will be sunk to the 600-ft. level, and from this point the territory formerly embraced in the Gatzert lease will be prospected.—The plant of the Little Florence Leasing Co. has been sold to the Buckeye-Tonopah Co. This plant, including a powerful compressor and costing about \$12,000, was installed by the leasing company only a month before its operations were suspended and its lease on the Fraction forfeited.—A 200-ton gyratory crusher has been installed in the Florence mill and the plant is now treating 160 tons per day. A spur has been extended from the Tonopah & Tidewater railroad to the mill.—The Thomas lease at Columbian mountain is down 140 ft. with a foot of shipping ore and 18 in. milling in an 8-ft. vein.

HUMBOLDT COUNTY.

The 70-ft. shaft of the Washakie mine, 26 miles south of Winnemucca, opened a body of high-grade ore and the company is planning the erection of a small mill.—The Seven Troughs Monarch Mining Co. is to resume operations shortly.—The Buckhorn and Florence lessees have found good ore in their blocks.

NYE COUNTY.

Two feet of \$50 ore has been opened on the claims of the Nevada National Mining Co., in Paulsen canyon. The main development on the property is the shaft, though the vein has been opened in several places by surface trenching. Nels Paulsen is superintendent.—The management of the Round Mountain Mining Co. is considering the use of a steam shovel at its property on the southern slope of the mountain. Should the company adopt this method, the capacity of the Sunnyside mill will be greatly increased. There are a number of properties in that district where the ground contains rich stringers that could be profitably handled on a large scale.

WHITE PINE COUNTY

The output from the Copper Flat group of the Nevada Consolidated is being kept up to the record work of last month and it is probable that the November tonnage will equal that of October. The main office of the Consolidated company has been moved to the eastern side of the Flat to

be nearer the work.—The 5-compartment shaft on the Alpha claim of the Giroux property is down four sets which have been re-inforced with concrete. The raise which was started from the 1000-ft. level to connect with the shaft is now within 320 ft. of the bottom of the shaft. The foundations for the machinery have been set in place and a head-frame and surface buildings are being erected.—On the Ely Consolidated the company is cross-cutting on the 400-ft. level of the Brilliant shaft, and has opened some ore that assays \$6 gold per ton.—A large hoist and compressor have been purchased by the Ely Calumet company, and will be installed at the mine in a short time when a 500-ft. shaft will be started. On the eastern slope of the mountain an adit will be started that will cut the ore at a depth of 1100 feet.

OREGON.

BAKER COUNTY.

The adit at the Ophir mine, in the Baker City district, being run to open the ore 200 ft. below the present workings cut a blind vein that was 7 ft. wide.—At a meeting of the stockholders of the Humboldt Gold Mines Co., held in Baker City, the management reported that the mill of the company in Mormon basin was running night and day and good ore was being blocked out in the mine. John Arthur was elected manager.—The tube-mill which was recently installed at the Cougar mine is running successfully.

UTAH.

BOXELDER COUNTY.

The Homber Mining Co., which has been opening a deposit of graphite four miles south of Brigham City for the past few months, made its first shipment of one car to Salt Lake City. W. W. Cannon is in charge of the work.

JUAB COUNTY.

The East Tintic Development Co. is shipping five cars of ore per week that is netting the company about \$700 per car. The management expects to open the ore on the 500-ft. level in a short time.—The Mammoth company is employing about 40 men and is shipping two cars of ore per week. It is understood that the company is trying to obtain a better rate with the smelter and will increase the output if this is obtained.—A new pump has been installed and sinking resumed in the shaft at the Tintic Central.—At the Eagle and Blue Bell mine good ore is being opened on the 900, 1000, and 1100-ft. levels. New machinery is being installed at the mine and a small hoist will be placed at the 1000-ft. level while sinking to the 1200.—Some good ore has been opened in the old Scotia mine in West Tintic and shipping resumed.

SUMMIT COUNTY.

The adit at the property of the Thor Mining Co., in the Park City district, is now in 200 ft. and has cut several stringers of ore. A shaft was started on the property but was abandoned on account of a heavy flow of water. The group will be drained, however, by the tunnel the Daly-Judge company proposes to drive. Peter Cass is in charge of the work.—The shaft at the New York Bonanza property is down 970 ft. This will be continued and cross-cuts started on the 1000-ft. level about the first of the year.

WASHINGTON.

OKANOGAN COUNTY.

(Special Correspondence).—The Q. S. Mining Co., operating between Loomis and Conconully, is installing a hydro-electric power plant and an air-compressor and will use air-drills in driving a 2400-ft. cross-cut to the vein, which will give a depth on the latter of 2000 ft. The ore is said to assay $2\frac{1}{2}$ to $4\frac{1}{2}$ copper, with some gold and silver. A. M. Dewey, of Spokane, is manager.—J. T. Plant is erecting a reduction plant in Ruby canyon, five miles south of Conconully.

Loomis, November 20.

STEVENS COUNTY.

(Special Correspondence).—The Oriole mine, in Metairie district, is being equipped with a steam boiler, Sullivan air-compressor, and two drills, which are to be in operation in December. The incline shaft, now 60 ft. deep,

is to be sunk to a depth of 350 ft. The ore now exposed is said to assay \$45 per ton in lead, silver, and gold. The vein has well defined walls and is 6 ft. wide. An adit and other work aggregates 700 ft. Joseph Lancaster, of Spokane, is directing the work, and Fred N. Davis is manager. —The United Copper Co., Conrad Wolfe, manager, has spent about \$100,000 developing its copper property 4½ miles northeast of Chewelah. Incidental to development the company has shipped about 1000 tons of copper ore. The principal development is from a 450-ft. shaft, but work has commenced on a 3000-ft. adit which is to intersect the vein at 1100 ft. below the surface. This work has advanced 200 ft., and an air-compressor and drills are being installed. A force of 16 men is employed. —T. F. Hertzell, of Chewelah, controls the property of the High Grade Silver

Sheep Creek district, has been acquired by a local syndicate, which has made one payment on the property. Work has been started on the group. —The second payment has been made on the Golden Fawn, which adjoins the Searchlight group, by the Vancouver bondholders. Work has not been commenced on this property as yet, but a contract has been let to drive a cross-cut adit. —Sinking of the main shaft on the Highland-Buckeye property has resulted in the discovery of a 4-ft. lead of good ore. The company shipped 26 tons of ore to Trail smelter in the early part of the month, but expects to increase its shipments materially as soon as the air-compressor and machine-drills are installed.

—After 30 days' hard work the railway into Sandon has been re-built over the slides and ore shipments resumed. Several of the important mines are soon to resume work and things look brighter for Sandon than they have for some years. —In the Portland Canal mining district, which has come noticeably to the front this year, active development work is being pushed on the property of both the Portland Canal Mining Co. and that of the Stewart Mining Co. A 200-hp. steam air-compressor has been ordered for the Red Cliff property, which will be a heavy shipper next spring. Money is being raised to build a short railway for hauling the ore to the water front, a distance of five miles. —Within a radius of 100 miles of Hazelton on Skeena river, there are three rich and promising mining districts, the Telkwa, Babine, and Nine Mile mountain. Notable examples of the operations in this district during the past season were the development and bonding of the Harris group at Nine Mile for \$60,000; the appraisal of the Telkwa coal fields by a Pittsburgh expert, the executing of several hundred feet of development work on the St. Eugene group, Babine, and the driving of a 400-ft. adit at the Dibble group, owned by James Cronin, one of the original owners of the St. Eugene at Moyle, the largest lead-silver mine in Canada. There is an excellent showing of silver-lead ore on the Dibble group. The country for miles around these two last named properties has been staked, and many promising veins of copper and silver ore uncovered.

Rossland, November 20.

MEXICO.

CHIHUAHUA.

The Dolores Mines Co. recently shipped two lots of high-grade ore from its Dolores mine 45 miles west of Madera to the El Paso smelter. The first lot of 25 tons assayed 16 oz. gold and 900 oz. silver per ton, and the second lot of zinc shorts assayed 18 oz. gold and 5000 oz. silver per ton. W. H. Paul is manager. —The grading for the spur to the New Palmilla mill at Parral has been completed and the rails will be laid in a short time. The cement for the concrete has arrived and the foundations are being constructed. —It is understood that the management of the Sta. Rosalia smelter is to double the present capacity of the plant to handle 500 tons of ore per day.

JALISCO.

The Dwight Furness company has just purchased 36 tons of high-grade gold-copper-silver ore from Edward Fitzpatrick at Ameca, the sale netting Mr. Fitzpatrick over \$200 per ton. —A cross-cut from the shaft under the old workings in the Boca Ancha mine, in the Ayutla district, opened a body of rich ore and the management is planning for the erection of a concentrator. —Charles Whittemore has organized a company which is backed by London and Paris capitalists to build a railroad from Chamela on the Pacific Coast to La Vega on the National lines. It is understood that over £1,000,000 has been subscribed for the enterprise. The line will be standard gauge and 325 kilometers long.

EAST SIBERIA.

At the Kolchan mines, despite a short season and low water, the clean-up is \$45,000 from approximately 35,000 cubic yards.



Portland Canal District.

& Copper Co., three miles from the town. He has opened a vein of high-grade copper, silver, and lead ore on the contact of slate and porphyry. A steam hoist and pump have been installed. —The Blue Star group, of seven claims, near that of the United Copper Co. has series of veins in lime and quartzite, containing silver, lead, copper, and gold. Mark Mitchell, of Chewelah, who operates the property, has a small force at work, and states that the percentage of copper increases with depth. —About \$100,000 worth of ore was shipped from the mine by previous operators, some of it assaying as high as \$60 per ton.

Chewelah, November 20.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence). —The Searchlight group of three claims near the Mother Lode and Nugget claims,

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. S. NOYES has gone to Oregon.
 W. E. THORNE is in San Francisco.
 HOWARD D. SMITH has gone to Spain.
 GEORGE H. GARREY is at Mapimi, Mexico.
 REEVES DAVIS was in Stockton this week.
 VICTOR F. G. SEAWELL is in San Francisco.
 WALTER HARVEY WEED is at Phoenix, Arizona.
 N. SAMWELL has gone to Milwaukee, Wisconsin.
 A. O. ZINN, of Manila, has been in San Francisco.
 J. E. SPURR has gone to Salt Lake from Portland.
 H. A. DENNY has returned from London to Mexico.
 GODFREY D. DOVETON is at the Santa Gertrúdis, Pachuca.
 W. H. CRAWFORD has returned to Boston from New York.
 C. S. HERZIG has returned to New York from Ray, Arizona.
 CLAUDE E. JAMISON, of Los Angeles, was in San Francisco.
 M. E. MACDONALD has just returned to New York from Cobalt.
 A. F. HUGHES has gone to the Rio Plata mine, Chihuahua, Mexico.
 RICHARD KLEESATTEL, of Seattle, Washington, has gone to National, Nevada.
 H. A. TITCOMB is at Salt Lake in connection with the Silver King litigation.
 J. R. FINLAY has been appointed general manager for the Goldfield Consolidated.
 WALTER G. PERKINS is in London and expects shortly to return to San Francisco.
 C. H. MUNRO has reached San Francisco from Nome and will spend the winter here.
 FRANK H. PROBERT is at Globe, Arizona, inspecting the Superior & Boston copper mines.
 F. W. DEWOLF and W. H. HERBON have returned to Urbana, Illinois, from New Orleans.
 J. H. MACKENZIE has resigned the position of general manager for the Goldfield Consolidated.
 E. H. MACDONALD, of Butte, Montana, has been making geological investigations at Chewelah, Washington.
 S. F. EMMONS recently received the honorary degree of Doctor of Science from his *alma mater*, Harvard University.
 VICTOR RAKOWSKY has completed an examination of zinc-lead properties in Oklahoma and has returned to Duluth, Minnesota.
 FREDERIC KEEFER, consulting engineer for the B. C. Copper Co., recently examined properties on Sheep creek, near Ymir, British Columbia.
 W. G. ANDERSON, recently with the El Favor Mining Co., Hostotipaquillo, Jalisco, Mexico, is now with the Compañía Minera La Republica, S. A., Sauz Dto. Rayon, Chihuahua, Mexico.

NICKEL used in the United States comes almost wholly from the deposits at Sudbury, Ontario, the domestic production being too small to be of much importance. In 1908 the imports for consumption had a total value of \$2,497,585; in 1907 the value was \$2,243,026. The United States refines much more nickel than it can use, so that, though not a producer, it is a large exporter. The exports in 1908 were 9,770,248 lb., valued at \$3,297,988, against 8,772,578 lb., valued at \$2,845,663, in 1907. Large quantities of cobalt minerals are contained in the silver ores at Cobalt, Ontario, and the greater part of the cobalt used in the United States comes from this locality. The imports for consumption in 1908 were 219,098 lb., valued at \$17,077.

Market Reports.

LOCAL METAL PRICES.

San Francisco, November 24.

| | | | |
|---------------------------|------------|---------------------------|---------|
| Antimony | 12-12½c | Quicksilver (flask) | 50-51½ |
| Electrolytic Copper | 16¼-16½c | Spelter | 7½-8½c |
| Pig Lead | 4.65-5.60c | Tin | 33-34½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|----------------------|-------|----------|-----------------|
| Nov. 12..... | 12.87 | 4.36 | 6.38 | 50¾ |
| " 13..... | 13.00 | 4.36 | 6.38 | 50¾ |
| " 14..... | Sunday. No market. | | | |
| " 15..... | 13.00 | 4.36 | 6.38 | 50¾ |
| " 16..... | 13.11 | 4.36 | 6.39 | 50¾ |
| " 17..... | 13.18 | 4.36 | 6.39 | 50¾ |
| " 18..... | 13.25 | 4.36 | 6.39 | 50¾ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Nov. 18. | Nov. 24. |
|------------------------|----------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 7 3 | 1 7 6 |
| El Oro..... | 1 5 3 | 1 5 6 |
| Esperanza..... | 2 19 0 | 2 16 3 |
| Dolores..... | 1 8 9 | 1 8 9 |
| Oroville Dredging..... | 0 11 9 | 0 10 0 |
| Mexico Mines..... | 6 3 9 | 6 0 0 |
| Tomboy..... | 0 18 9 | 0 18 9 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. November 24. | Closing prices. November 24. |
|---------------------------------|---------------------------------|
| Amalgamated Copper..... 89¼ | Miami Copper..... 16½ |
| A. S. & R..... 100¼ | Mines Co. of America..... 7½ |
| Boston Copper..... 20 | Montgomery-Shoshone..... 13½ |
| B. C. Copper Co..... 7 | Nevada Con..... 27½ |
| Butte Coalition..... 30¾ | Nevada Utah..... 1½ |
| Cumberland-Ely..... 8½ | Newhouse..... 33½ |
| Davis-Daly..... 6 | Nipissing..... 10¾ |
| Dolores..... 6½ | Ohio Copper..... 5½ |
| El Rayo..... 2½ | Ray Central..... 2½ |
| Ely Central..... 13½ | Ray Con..... 21½ |
| First National..... 6¼ | Superior & Pittsburg..... 16½ |
| Giroux..... 10½ | Tenn. Copper..... 40¾ |
| Guanajuato Con..... 1½ | Trinity..... 11½ |
| Inspiration..... 7½ | Tuolumne Copper..... 3¼ |
| Kerr Lake..... 8 | United Copper..... 6¾ |
| La Rose..... 4¼ | Utah Copper..... 50½ |
| Mason Valley..... 17½ | Yukon Gold..... 5 |

COPPER SHARES—BOSTON.

| Closing Prices. November 24. | Closing Prices. November 24. |
|---------------------------------|---------------------------------|
| Adventure..... 5¾ | Mohawk..... 62½ |
| Allouez..... 57 | North Butte..... 64¼ |
| Atlantic..... 11½ | Old Dominion..... 52½ |
| Calumet & Arizona..... 105 | Osceola..... 169 |
| Calumet & Hecla..... 680 | Parrot..... 30 |
| Centennial..... 38¼ | Santa Fe..... 2 |
| Copper Range..... 83¼ | Shannon..... 16½ |
| Daly-West..... 9 | Superior & Pittsburg..... 16¼ |
| Franklin..... 16½ | Tamarack..... 66 |
| Granby..... 102 | Trinity..... 11 |
| Greene-Cananea, ctf..... 12¼ | Utah Con..... 46½ |
| Isle Royale..... 26¼ | Victoria..... 31½ |
| La Salle..... 15¾ | Winona..... 7¾ |
| Mass Copper..... 7 | Wolverine..... 145 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, November 24.

| | |
|------------------------------|-------------------------------|
| Atlanta..... \$ 11 | Midway..... \$ 18 |
| Belmont..... 68 | Montana Tonopah..... 82 |
| Booth..... 10 | Nevada Hills..... 70 |
| Columbia Mtn..... 7 | Ophir (Comstock)..... 1.52 |
| Combination Fraction..... 53 | Pittsburg Silver Peak..... 63 |
| Daisy..... 8 | Rawhide Coalition..... 20 |
| Florence..... 2.67 | Rawhide Queen..... 70 |
| Goldfield Con..... 8.02 | Round Mountain..... 56 |
| Gold Kewenas..... 5 | Sandstorm..... 3 |
| Great Bend..... 3 | Silver Pick..... 8 |
| Jim Butler..... 11 | St. Ives..... 9 |
| Jumbo Extension..... 13 | Tonopah Extension..... 49 |
| MacNamara..... 29 | Tonopah of Nevada..... 6.50 |
| Mayflower..... 9 | West End..... 23 |

(By courtesy of the San Francisco Stock & Exchange Board.)

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

GYPSUM A MINERAL.

Gypsum is a mineral and lands containing it are mineral lands within the meaning of the United States Statutes providing for the location of mines and their relation to mineral lands.

Madison v. Octave Oil Co., (Cal.) 99 Pac. 176, Dec. '08.

LEASE OF MINES—FORFEITURE.

Where the owner of lands leased the mineral rights therein to another, on condition that if the property remain idle for 30 successive days, the lease should be void, the condition being broken, the lessor had a right to treat the lease as null and void, and sue and recover possession.

Trumbo v. Persons, (Ky.) 118 Southwest. 916, Apr. '09.

OIL LEASE—RECISSION.

The purchaser of an oil lease is not prevented from maintaining an action for the recission thereof on the ground of fraud, for the reason that he had used up a part of the oil which he had received from the property, because of his inability to place the purchaser in statu quo. While he had rendered impossible the restoration in specie of all that he had received in the transaction, it was sufficient in such case if he restored or offered to restore its money equivalent; and this is the rule where the property received is used or lost so that it cannot be restored in specie, when its value is capable of being ascertained.

Bayse v. Paola Ref. Co., (Kan.) 101 Pac. 658, Apr. '09.

LOCATION OF MINE—FAILURE TO PERFORM ASSESSMENT WORK—FORFEITURE.

The United States Statutes provide that on failure by the locator of a mining claim to perform the required assessment work, the claim shall be open to re-location, provided the original locator has not resumed work on the claim after such failure and before a re-location is made. Under this statute it has been decided in California that a mere failure to comply with the requirements as to the performance of the assessment work did not terminate the right of the locator; that the only effect of such failure was to throw the land open to location by others; and in the absence of any other location, the original claimant had the right to resume work and hold his claim. And this right and his estate is not divested until there has been a peaceable entry for the purpose of re-location by another person.

Madison v. Octave Oil Co., (Cal.) 99 Pac. 176, Dec. '08.

FLOODING MINE—DAMAGES.

A corporation drilling a well on its own land, but near a mine, drilled through sandstone into a shale that lies above the slate which served as a roof immediately over the coal in the plaintiff's mine, and the loose shale permitted the water to pass through it down to the slate and to weaken the strength of the covering of the mine so that it fell and caused the mine to be flooded. It was charged that the company drilling the well knew the subterranean formations in that locality, and that if it drilled the well as it did, injuries would result to the mine. It was also charged that after the well had been drilled and the water began to flow from it into the mine the company made no effort to prevent it. In an action for damages, the court left it to the jury under proper instructions to determine whether the defendant in drilling the well should have had such knowledge of the character of the strata as would lead it to believe that the water might flow from the well into the mine; and that if such was the character of the strata, and the fact was of common notoriety, the company would be chargeable with such knowledge and under the instructions and the facts, a judgment for the plaintiff for the damages was sustained.

Muntz v. Cottage Hill Land Co., (Pa.) 72 Atl. 247, Jan. '09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

DEVONIAN FAUNA OF THE OURAY LIMESTONE. By E. M. Kindle, U. S. Geol. Surv., Bull. 391, Pp. 60. Ill. Washington, 1909.

LANDSLIDES IN THE SAN JUAN, COLORADO. By Ernest Hoge. U. S. Geol. Surv., Prof. Paper, 67. Pp. 58, ill. Washington, 1909.

PRODUCTION OF CHROMITE IN CANADA. Department of Mines. Pamphlet, 6 pages. Ottawa, 1909. Figures for the year 1907-8.

SPIRIT LEVELING IN WEST VIRGINIA, 1896 TO 1908. Compiled by S. S. Gannett and D. H. Baldwin. U. S. Geol. Surv., Bull. 399. Pp. 81. Washington, 1909.

PRODUCTION OF ASBESTOS IN CANADA. Department of Mines. Pamphlet, 8 pages. Ottawa, 1909. Figures of production for 1907-8 are given.

INVESTIGATIONS RELATING TO PETROLEUM AND NATURAL GAS IN 1908. By Robert Anderson, D. T. Day, J. A. Taff, W. J. Reed, and C. W. Washburne. U. S. Geol. Surv., Bull. 381-D. Washington, 1909.

METALLOGRAFIA. By Umberto Savoia. 4 by 6, pp. 205, 94 fig. Milano, 1909. Published by Ulrico Hoepli. Price \$1. A historical sketch of the science, description of methods of preparation of microscopic sections, and a general account of the metallography of iron and steel.

MINERAL RESOURCES OF THE UNITED STATES FOR 1908. U. S. Geol. Surv., Washington, 1909.

Advance separates as follows have been received: Production of Antimony, Arsenic, Bismuth, Selenium, and Tellurium, by F. L. Hess; Iron Ores, Pig Iron, and Steel, by E. C. Harder; Glass Sand, Other Sand, and Gravel, by E. F. Burchard.

YAKUTAT BAY REGION, ALASKA. By R. S. Tarr and B. S. Butler. U. S. Geol. Surv., Prof. Paper, 64. Pp. 183, ill. Washington, 1909.

This report includes accounts of the physiography and glacial geology by Mr. Tarr, and of the areal geology by Mr. Tarr and Mr. Butler. It is accompanied by an excellent map.

METALLURGY OF THE COMMON METALS. By L. S. Austin. Second edition, rewritten and enlarged. 6 by 9. Pp. 494. Fig. 195. Index. MINING AND SCIENTIFIC PRESS, San Francisco, 1909. Price \$4.

Metallurgy is a broad subject, and to describe a large part of it in a single volume seems impossible. Gold, silver, iron, copper, lead, and zinc, are well described by Mr. Austin, however, in his second edition. There are many processes of treating the ores of these metals, and many of them are new or are much improved, but all the things that are most important are found in this book. We do not expect to find everything known compressed into one volume, nor do we want all that has ever been written, collected into one great work. The matter would be too voluminous to be of any use. But when someone that knows gives us the principles, arranged and ready to use, out from the confusion of it all, we are glad to get them. Mr. Austin has done this by eliminating unimportant things and exposing the real thing for us to see. The illustrations are good, and the five hundred pages of description present the subject clearly. It would be an exceptional man who could read the book without profit, and a dull one that could not understand it. For a beginner it is safe and is built squarely upon conventional lines. For the expert it is alive with modern American conditions and best practice. For the man that has begun to realize that he must have in his library the knowledge that he cannot hope to keep uppermost in mind, it is a book important to have.—K. F. D.

COMPANY REPORTS.

BROKEN HILL SOUTH SILVER MINING COMPANY.

The properties of this company, though situated at Broken Hill, New South Wales, were not involved in the labor troubles of the last year. Accordingly the report for the half year ending June 30, shows £40,000 paid in dividends, £10,416 written off for depreciation, and a balance credit of £120,638 carried forward, with £58,902 net liquid assets. A contract has been made with the De Bavay's Treatment Co. for treatment of zinc tailing on joint account for seven years, with a possible extension of three years. The terms involve an advance of 3s. 6d. per ton as delivered. After a similar amount has been credited to the treatment company, actual costs are to be figured and the balance divided. This contract is to go into force January 1. In the meantime the tailing is being sold to the De Bavay company at a flat rate of 3s. 6d. The ore hoisted in the half year amounted to 112,288 tons, assaying 16.2% Pb, 5.6 oz. Ag, and 12.1% Zn. Of this, 68% came from the 825 and 970-ft. levels of the mine. This ore was produced with an average daily attendance of 261 surface men and 540 underground. The ore reserves are estimated by W. E. Wainwright, manager, at 3,250,000 tons, to which may be added the following products on hand: old mill tailing, 1,078,743 tons, assaying 3.7 oz. Ag, 6% Pb, and 16.7 Zn; new mill zinc tailing, 74,602 tons, assaying 3.4 oz. Ag, 4.1% Pb, 18.7 Zn; old mill slime, 140,432 tons, assaying 6 oz. Ag, 14.7% Pb, 16.7 Zn; new mill slime, 35,366, assaying, 5.8 oz. Ag, 13.4% Pb, 12.1 Zn. The cost for the period amounted to 13s. 10.6d. per ton of crude ore, divided into 9s. 2.5d. for mining, 9s. 11.6d. for development, 3s. 11d. for concentrating. This is equivalent to £4 12s. 3.1d. per ton of concentrate. The report includes a large amount of other data of interest to technical men, and particularly to American zinc producers.

BULLION MINING CO., LTD.

This company owns a copper property in the Coeur d'Alene district. The report of the manager under date of October 1 shows that 1899 ft. of development has been accomplished, and J. P. Rowe is authority for the statement that the vein is nearly vertical, is 4 to 15 ft. wide, and that two ore-shoots have been discovered. The company is capitalized at \$1,500,000, with 361,812 shares of a par value of \$1 each, still in the treasury. The expenditure to date has amounted to \$46,820, less \$1384 cash on hand. This money was realized by treasury stock sales to the amount of \$30,739, assessments, \$15,364, and advances, \$717. The property is evidently some distance from profitable production. The contrast between capitalization and actual expenditures is startling, but characteristic of the optimistic attitude of promoters. The auditors' report in this case is detailed and full. The account of the property itself is less satisfactory.

L. VOGELSTEIN & Co. give the following figures of German consumption of foreign copper for the months January to September, 1909:

| | Tons. |
|------------------------|---------|
| Imports of copper..... | 120,927 |
| Exports of copper..... | 5,967 |

Consumption of copper..... 114,960

Consumption during the same period in 1908 was 116,162 tons. Of the above quantity 110,840 tons were imported from the United States.

ANTIMONY was not largely produced in the United States in 1908, according to the Geological Survey. Only one lot of ore whose value was chiefly confined to its content of antimony was mined and marketed—a lot mined near Mill City, Nevada. Most of the antimony sold in this country is contained in antimonial lead, from which the lead is not separated in its common uses. Antimony, unlike most other metals, does not shrink in volume on cooling after it has been melted; on the contrary, it expands, and for this reason it is used, generally in the form of antimonial lead combined with other metals, in making printer's type and other castings requiring sharp faces or outlines.

Commercial Paragraphs.

The PACIFIC FOUNDRY Co., of San Francisco, California, announces the sale of three Kilker's matte tapping cars to the Modern Smelting & Refining Co., Utah Junction, Denver, Colorado.

The Hardinge conical mill is being tested by the Johannesburg Mines Investigation committee. This mill is to handle the ores shipped for testing by many of the largest mines in South Africa.

W. L. COOPER, manager of ROBERT W. HUNT & Co.'s European business, sailed from New York on November 10, returning to London after the completion of his annual business trip to the United States.

The Jackson hand-power rock-drill was awarded a gold medal at the Alaska-Yukon-Pacific Exposition. The award covers efficiency and ease of operation. This drill is made and sold by THE MINING SUPPLY Co., New York.

The services of C. E. ALLEN have just been secured by the WESTINGHOUSE ELECTRIC & MFG. Co. in connection with the sales of transformers. Mr. Allen was formerly connected with the General Electric Co. in a similar capacity, but resigned from that company during the past summer.

THE FOOS GAS ENGINE Co., Springfield, Ohio, announces the receipt of an order for six 150-hp. three-cylinder Foos vertical engines from the Hazel-Atlas Glass Co., Wheeling, West Virginia. The latter company has been using a number of these same engines during the last eight years, and hence the order is an indication of the satisfaction Foos engines are giving for power-plant service. The engine company advises that its factory is running at full capacity, employing two shifts, and still is unable to keep up with orders.

THE C. O. BARTLETT & SNOW Co. announces the following recent sales: Crow's Nest Pass Coal Co., Fernie, British Columbia, additional coal-handling machinery; Maryland Steel Co., Steelton, Pennsylvania, conveyors and elevators; National Refining Co., Findlay, Ohio, conveyors and elevators; National Tube Co., Pittsburg, Pennsylvania, conveyors and elevators; Winding Gulf Colliery Co., Cincinnati, Ohio, complete coal tipples and Greene Self-Dumping Car Haul, through F. C. Greene, engineer; United States Smelting, Refining & Mining Co., Salt Lake City, Utah, ore dryer.

A Large Blast.

An unusually large amount of rock, 120,000 cu. yd., was recently brought down by a single blast at Morena, California, in connection with the construction of a dam for the Southern California Water Co. An adit 125 ft. long was driven straight into the face of the hard granite rock to be blasted. The mouth was at the foot of the sloping rock, over the face was a burden of 140 ft. Two short side drifts from the main adit had been driven, in which had been placed 33,550 lb. of Champion powder, 2000 lb. of 60% dynamite, and 3400 lb. of 40% dynamite, 38,950 lb. in all. Three 20-ft. double-strength electric fuses, connected in series, were used, the fuses being buried in the loose powder and brought out along the west wall of the tunnel. The side drifts and main adit were well tamped with fine dirt. The main adit was filled with earth and rock tamping to within 20 ft. of the adit mouth. Five hundred feet of double-lead wire connected the tunnel wiring and the battery. During the loading the men were required to surrender matches and smoking materials, and their feet, from which their shoes had been removed, were covered with sacking. The circuit was tested frequently during tamping, that possible breaks might be detected and repaired before burying the wires too deeply.

ARSENIC during 1908 was produced in a commercial way at only two places in the United States—by the American Smelters Securities Co., at its plant at Everett, Washington, and by the Washoe Copper Co., at the Washoe smelter, Anaconda, Montana, according to the United States Geological Survey. The product was in the form of white arsenic (arsenic trioxide) and was derived largely from flue-dust.

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TABLE OF CONTENTS.

| | |
|---|-------|
| EDITORIAL: | Page. |
| Notes | 739 |
| Food and Mining in Mexico..... | 740 |
| Pacification of Nicaragua..... | 740 |
| The Prospectors' and Miners' Agency..... | 741 |
| The Cherry Coal Mine Disaster..... | 741 |
| ARTICLES: | |
| Tunnel Driving in Colorado.....H. Foster Bain | 743 |
| Public Lands and Needed Legislation..... | |
|Richard A. Ballinger | 748 |
| World's Petroleum Production..... | 750 |
| Outcrop of Orebodies.....William H. Emmons | 751 |
| White River Copper Properties..... | |
|Guy A. R. Lewington | 755 |
| Relative Merits of Acid and Basic Processes..... | 756 |
| Cyanidation of Manganese Silver Ores..... | |
|E. M. Hamilton | 756 |
| Graphite—An Obstacle to Good Cyaniding..... | |
|M. W. von Bernwitz | 758 |
| Costs at the Braden Copper Mine..... | |
|William R. Braden | 759 |
| Murex Magnetic Process.....Ernest Levy | 777 |
| DISCUSSION: | |
| All-Sliming.....Hurley St. J. Brooks | 760 |
| Time-Sheet Voucher.....W. P. Dunham | 760 |
| Modern Quicksilver Reduction...Clifford G. Dennis | 761 |
| American Merchant Marine.....W. C. Wynkoop | 761 |
| CONCENTRATES | 762 |
| SPECIAL CORRESPONDENCE | 763 |
| GENERAL MINING NEWS..... | 769 |
| DECISIONS RELATING TO MINING..... | 776 |
| DEPARTMENTS: | |
| Personal | 774 |
| Metal Prices | 774 |
| Market Reports | 775 |

EDITORIAL.

WESTERN headquarters for the Cole-Ryan interests are to be established at Salt Lake, to facilitate the handling of details regarding mining in Nevada and Utah especially. Their Butte mines and all general financial policies will continue to be directed from New York.

THOSE who are familiar with the recent litigation between the Calumet & Hecla Mining Company and Mr. A. S. Bigelow over the Osceola stock, will understand that a consolidation of that corporation with other copper producers would be impossible. By the laws of Michigan such an act would operate forfeiture of charter. In this, combined with the low cost of its copper, are found sufficient reasons for the lofty isolation of the great Michigan copper company.

THE sixty-first meeting of the American Association for the Advancement of Science, will be held in Boston, December 27 to January 1. At the same time the usual meetings of the affiliated societies, now grown to number twenty-seven, will be in session. The A²S, as the association is frequently called, is a large and important organization. It serves a most useful purpose in bringing together once a year, the leaders in the various branches of science. This year Mr. David Starr Jordan will be the presiding officer.

THE MAGNITUDE of the interests of the Consolidated Gold Fields of South Africa is instanced in the fact that for the year ended August 31, its subsidiary companies, the Simmer & Jack, Robinson Deep, Knights Deep, Simmer East, Jupiter, Simmer Deep, and Nigel Deep, produced 984,302 ounces of gold. These companies employ 1350 stamps of the 9842 dropping on the Rand, and 24 of the 144 tube-mills there in use. They crushed 3,224,168 of the 22,033,857 tons of ore handled, and made a total mining profit for the year of £1,658,966.

PROMOTERS' ways are many and devious and new means of booming stocks constantly are found. They stop at no means. Last April Mr. Waldemar Lindgren was quoted in *The Herald*, of Parker, Arizona, as praising in most extravagant fashion a property near that place. He promptly sent a denial of the statements attributed to him, but only in October was his letter printed. In the meantime stock in the company possessing this particular hole in the ground, was jumped from 15 cents to 50; a flattering recognition, at least, of the value of Mr. Lindgren's opinion. It was only after the stock was sold and the promoter had left the country that *The Herald* published Mr. Lindgren's denial. It now

affects a finely righteous indignation against the wiley promoter. The whole transaction is, unfortunately, typical of the ordinary attitude in a mining camp where 'boosters, not knockers, are wanted'—regardless too often of the truth.

RECIPROCITY with a club is a frequent feature of trade relations with Germany. It is now intimated that the Reichstag may impose an export tax on crude potash. This has been met by rumors from Washington, said to be 'inspired', that the clause of the Payne-Aldrich tariff bill providing for reprisals in case of unjust discrimination, may be applied to meet such action on the part of Germany. Since the latter country holds a monopoly upon potash it is not surprising that it should guard this exclusive asset jealously. It is well to remember that this spirit may be operative in the German mind as well as that of taking commercial advantage of the situation. In any case, it indicates the importance of continued efforts to discover deposits of potash in this country. America consumes half of the total exportation of German potash, the value of that product taken in 1908 exceeding \$5,000,000.

PETROLEUM lands to the extent of three million acres, lying in California, Wyoming, Utah, and Oregon, have been withdrawn from entry. This is a temporary measure to promote a proposed revision of the laws controlling the disposition of such lands. The anomaly of considering oil land as placer has long led to confusion and trouble. The insistence on actual discovery in order to perfect title, in this case works hardship, since in the nature of the case honest discovery can only be made by drilling, and this necessitates more rapid development than is usually wise if any considerable area is to be held. It would seem that oil lands afford a good field for a trial of the leasing system. It is the plan upon which most of the oil territory in the United States has been opened and is one with which all oil men are familiar. Its adoption would equalize conditions between different oil fields, would enable the Government to reserve as much oil as might seem necessary for naval uses, would promote economical rather than wasteful development, and would take full advantage of the slow growth of experience in oil development. The present situation demands prompt remedy.

Food and Mining in Mexico.

Trade between the Latin-American countries has been relatively unimportant up to the present, and has been due chiefly to natural attraction resulting from propinquity. A new departure is now to be made, however, which strikingly illustrates the growing commercial power of the southern republics. The industrial development of Mexico has been steadily reducing the production of grain in proportion to the consumption, so that corn-famines have become increasingly frequent. At the same time it has been observed that Argentina consumes large quantities of manufactures from heniquen, which is produced in Mexico and exported to the

extent of \$15,000,000 yearly to the United States. Arrangements are now being made with the Lloyd-Brasillero steamship line to establish regular steamship service between Mexican ports and Buenos Aires. It is said that orders for 300,000 tons of Argentine corn have been placed in Mexico as a basis for initiating such trade relations, and that rope and jute-sack factories will be established in Argentina to consume Mexican heniquen. These activities may be taken in a certain sense as a measure of the rapid growth of the Mexican mining industries which have drawn so large a proportion of the population from agricultural pursuits. The opening of the Southern Pacific of Mexico's line to Guadalajara will, of course, admit the products of the great agricultural regions of Sonora, Sinaloa, and Tepic to the central plateau markets. Cheap supplies will promote the mineral development of the country. Cheap food is an essential to the economic conduct of mining operations, and Mexican mines are constantly being embarrassed by a shortage of corn and beans. The Mexican Government has appointed a *junta* to purchase and distribute these necessities throughout the Republic. The Government will buy 200,000 hectolitres of corn, equivalent to 30,870,000 pounds, and bids for beans have been submitted from California, Austria, Spain, and other parts of the world. Some mining companies in Mexico have found it profitable to rent land under their control to natives, furnishing seed, and in other ways encouraging local production. This not only keeps down the local price, but serves to check the tendency of Mexican miners to quit work at the planting season to raise crops in the vicinity of their homes, a custom which causes great fluctuation in the available force at the mines. It is certainly the part of wisdom to facilitate food production in the vicinity of such properties. In the United States this matter regulates itself, but conditions in Mexico are different.

Pacification of Nicaragua.

Political changes are imminent in Nicaragua. These will mean much to American investors in the mines of that Republic. The reign of Zelaya is evidently near its end. Only a decisive victory over the revolutionists could now re-establish his power so that he would be able to compel Secretary Knox to disregard the threats contained in the letter accompanying the passports handed to Mr. Felipe Rodriguez, *Charge d'Affaires* for Nicaragua, on Wednesday last. The execution of Messrs. Cannon and Groce, American citizens, taken under arms in the service of the Nicaraguan insurgents, is there interpreted as a personal offense chargeable to the authority by whose order the execution was made. That means Zelaya! If unsuccessful in repressing the revolution, Zelaya would be condemned to death by his triumphant opponents, sure of the acquiescence of the American Government: if successful—what would Mr. Taft do to make good the threat of his Secretary of State? Would the United States assume the rôle of guardian, as it did toward Cuba? Would such a step, if taken, recognize the interest which neighbor nations have in regard to their independence, by engagements made with them to with-

draw upon restoring a stable government? This country can ill afford to arouse suspicion of its motives on the part of the Mexican people. A line must be drawn between the official co-operation of the Mexican Government in this Nicaraguan affair and the anxiety felt by the masses. Mutterings come from many quarters south of the Rio Grande, concerning undue influence by the United Fruit Company in the revolt against the Zelaya administration. That company failed to enjoy favor in the eyes of the potentate at Managua. There was also friction at Bluefields, the hatchery of the revolution, between Mr. Samuel Weil and Belanger's Incorporated, which is supposed to have had political bearings. American interests were evidently involved to such an extent in the beginnings of the uprising that we may well watch the end to see that iniquity is not done. There are other ways of robbing the Nicaraguans than through Presidential graft, and the American Government cannot afford to take a hand in a game played for the advantage of a few of its citizens in a foreign country. We are not apologizing for Zelaya; he is an intolerable anachronism; a monster, though parading in garments and etiquette borrowed from Paris: but it is not certain that his antagonists were altogether inspired by high moral purposes. Stability of government, however, is now assured, one way or the other, and the license of a dictatorial ruler will be restrained by assurances better guaranteed than those given in the Washington treaty for Central American arbitration and neutrality. Under such favoring conditions the mineral resources of Nicaragua will soon make of that country one of the great gold producers of the world.

The Prospectors' and Miners' Agency.

Pennsylvania is a great State. It is the home of the iron and steel industry. It has produced more coal and more coke than any other State in the Union. It has also produced a Quay and a wonderful State House, built for four million dollars "within the estimates," and furnished for more than three times that sum 'without estimates'. It is, finally, the home of the Prospectors' and Miners' Agency. Maybe you do not see the connection, but that is because you do not know the Prospectors' and Miners' Agency. This, according to its advertising matter, was organized in 1889, and since then has been engaged in manufacturing instruments "for tracing and locating treasures, mines, and minerals." The agency states that "we sell ten to every one of any other so-called instrument on the market." This is not altogether clear, but if it is to be interpreted that there are only one-tenth as many fools buying from others as from the Prospectors' and Miners' Agency, we sincerely hope it is so. Some way we are a bit chary of accepting some of the statements made by the agency. They are too good to be true. We have been accused of being too conservative, perhaps the reason for our doubts lies in this. We would like to believe—who wouldn't? There now is the wonderful "Goldometer—latest improved, patent applied for." It is clearly "a very convenient instrument for prospectors, miners, and treasure seekers," and is said to be "very powerful in locat-

ing the spot of underground treasures as its magnetic force always works perpendicular." Then there is the 'No. 2 Spanish needle'. Really a delightfully simple contrivance with separate points for iron, silver, and gold. You adjust the one you prefer and presto, there you are! Any one can find a mine! No, not quite any one, but, well, nearly everyone—nine out of ten, say. Owing to "lack of knowledge and magnetism" in the stray tenth man, the agency "cannot guarantee that each and every one will be equally successful." Of course not. We feel sure of that.

But listen to "what our customers say." P. M. M., for example, writes from Ramer, Alabama, under date of May 19, 1901, "I have discovered a silver mine on my plantation with this instrument, the miners and the minerolists value this mine at \$800,000." Now wouldn't that satisfy you? If not, how about this, from M. M. M., of Chapel, Mississippi, April 25, 1903, "I located the richest silver mine known—about 30 feet wide and about 40 miles long." No doubt about that certainly! Still we have not noticed that the silver output of either Alabama or Mississippi has increased since these discoveries. Perhaps this is magical silver and vanishes when brought to the surface. However, there is one statement made by the Prospectors' and Miners' Agency that we believe wholly and unreservedly: "We could continue to write testimonials like these until the number would run into thousands."

Possibly you are not interested in prospecting instruments. If not, how about a 'Treasure Ring'. What? Never heard of them? They are "commonly known as The Prospector's Ring or The Miner's Ring"—that fixes 'em for you surely. "'Tis said and claimed by many that this ring when worn while seeking for hidden treasures of any sort will aid them wonderfully in finding the exact spot quickly"—and only \$3, too! Not tempted even by this? You are a hard customer. We shall have to await the usual 'follow-up literature' before we know what to say to you. In the meantime we wonder how such literature gets through the mails.

The Cherry Coal Mine Disaster.

The mine fire at Cherry, Illinois, has proved one of the most serious of which there is record. The loss of nearly 300 men, with all that this means in the making of widows and orphans, is a disaster which from very magnitude has touched the hearts of all concerned in mining. Fortunately metal mines are not so prone either to explosions or fires as are collieries; nevertheless there are abundant lessons, applicable to other situations, to be drawn from the accident in Illinois. It is too soon, and we are too far from the scene, to attempt to fix the blame. That is the duty, under the law, of the State Inspectors; and those of Illinois are abundantly able to fulfil their duty in this, as in other directions. Lessons for the future may, however, be drawn, even if blame cannot yet be equitably portioned. The first and greatest lesson is the necessity for preparedness.

Accidents rarely, if ever, happen when and where they are anticipated, and the wise mine manager

must be eternally vigilant—always on the watch for the unexpected. Not only must he personally take this attitude but he must organize his corps of assistants so that each will know his place in case of fire, explosion, cave-in, or other accident. The value of this, and of frequent practise in anticipation of accidents, was splendidly shown in the case of the burning of the *St. Croix* which occurred almost contemporaneously with the Cherry accident. In the one case a steamer, out on the ocean, burned and sank. Ammonia fumes prevented a successful fight against the fire, but the disciplined officers and crew took the 300 inexperienced passengers to shore and safety without the loss of a life. Each man knew his place, discipline was perfect, and the disembarkation was carried on without a hitch. At Cherry the fire was underground; smoke and black-damp instead of ammonia interfered with fire-fighting. Discipline broke down and 300 men were lost. There seems to have been plenty of time, with right organization and generalship, to have got all the men out. Certainly it would have taken less time to have got the men out of the mine than the passengers off the *St. Croix*, and yet at the mine the lives were lost and on the steamer all were saved. However it may have seemed at the time, events prove that it was a mistake not to have called the men out of the mine at the first alarm of fire. It is better to lose a good many shifts than human lives.

In the second place, the mine organization should be like that of the army in providing a trained substitute for each man that falls. Apparently, at Cherry, when the bosses were fighting the fire on the second level, no one took their places as leaders elsewhere. The same lesson might have been learned at the Ziegler explosion a year earlier. There a number of the leaders being overcome while engaged in rescue work, none were available to take their place. Don't send all your officers on one charge! Keep a reserve, and have a flexible organization.

A third lesson to be learned is that of the value of discipline among the men themselves. The twenty-one that were rescued after a week's entombment came through alive because they submitted to be led. They obeyed orders. The men who died might, many of them at least, have been alive and well today had they not lost their heads and rushed into the most dangerous part of the mine. There is no question that discipline has been growing progressively weaker among the miners in Illinois, and probably elsewhere. This has been frequently charged to the influence of the labor unions. We are sorry to say that we believe there is substantial ground for this charge, but the fundamental trouble lies deeper. The breaking down of discipline through the union is only incidental to the fact that the coal mining industry in the Middle West has been run on so narrow a margin of profit that the operator has been in no position to stand for his rights. He has been obliged to keep going on almost any terms. The men, knowing this, and having in certain districts long arrears of petty injustices to pay off, have presumed on their position and made it difficult if not impossible to discharge a man as a means of

discipline. There can be little doubt that many of the lives lost will be found to have been sacrificed by someone's disobedience of orders. The engineer who refused to disobey orders and hoist the cage on which the rescue party burned to death, was right. More of that sort of spirit would in the end save lives.

Finally, it is interesting to observe that the judgment of the inspectors in ordering the shaft sealed was vindicated by the results. It was the only way, with the means at hand, to put out the fire, and no men could be rescued till the fire was conquered. The men who were saved adopted exactly the same tactics; they sealed themselves off from the fire and trusted to the air stored in the workings. Thus they gave the lie in the most direct fashion to the hysterical individuals who were shouting that the company was sacrificing the men to save the mine. It was the only way to save the men—but the men ought never to have been caught in such a trap.

The one cheerful feature of the whole situation is the intelligence and heroism displayed in the rescue work. The men who went down on the fatal last trip of the cage deserve the kindest thoughts of their fellow men, but these thoughts, too, should go out to those others who took equal risk and came out alive. To give the whole list would be impossible and with the data at hand the most deserving may well be omitted. We cannot forbear to mention Messrs. Tom Moses and James Taylor among the State Inspectors, R. Y. Williams and J. R. Webb, of the United States Geological Survey, Henry Smith and James Hand among the men. These, wearing the oxygen helmet, went down into the mine when conditions were wholly unknown and when, as was shown only too clearly at Cardiff in the same State, the greatest danger was to be anticipated. Their pioneer work, with doubtless that of others whose names have not come to us, made possible the re-opening of the shaft and the rescue of the men still living. Their work illustrates the usefulness of the helmets in advance work following an explosion. There should be a trained and equipped corps of men available in every mining camp, ready to respond to every call, like the old volunteer fire departments. These, and first aid corps such as have been organized in the anthracite districts, would do much to decrease the loss of life after an accident has occurred. To prevent accidents, which after all is the great desideratum, better organization, more study of the subject, and unceasing vigilance are needed. We recently had the pleasure of reviewing a little book by W. E. Garforth, who has done such excellent mine-rescue work in England, and were pleased to find that whereas the title was, 'Suggested Rules for Recovering Coal Mines After Explosions and Fires', a full third of the text was devoted to what to do before the accident occurs. That is the spirit in which work needs to be done, and as a valuable means of organizing and disseminating knowledge directed toward preventing mine accidents, we believe the present Technologic Branch of the United States Geological Survey should be expanded into a Bureau of Mines. The most expensive economy is that which seeks to economize knowledge.

TUNNEL DRIVING IN COLORADO.

Written for the MINING AND SCIENTIFIC PRESS
By H. FOSTER BAIN.

Colorado is becoming famous for its tunnels, a not unnatural result of its rough topography with high mountain ranges cut by deep canyons and gorges. Many of the railway lines pierce the mountains, and recently the longest tunnel in the United States, 30,-

experience has shown that long tunnels are too expensive to be undertaken for prospecting alone. Their utility lies in cheapening costs of production and rendering accessible orebodies already fairly assured.

The Newhouse tunnel, at Idaho Springs, and the Roosevelt, at Cripple Creek, are probably the most important among those now being driven in Colorado. The former was originally projected mainly as a transportation agency and only later came to



West End of Quartz Hill, Central City.

These mines are undercut at a depth of 1550 ft. by the Newhouse tunnel.



Russel Gulch, Gilpin County, Colorado.

The Old Town mine at the right is connected with the Newhouse tunnel by a 4000-ft. lateral.

582 ft. from portal to portal, has been completed near Montrose, Colorado, by the United States Reclamation Service. Of greater immediate interest to mining engineers are the long adits and cross-cuts found in nearly all the mining districts and which local custom designates as tunnels. The Revenue tunnel at Ouray, the Cowenhaven, at Aspen, and the Yak at Leadville, may be cited as types. Such tunnels are usually driven mainly to facilitate drainage of mines already well developed. To a subordinate degree they are expected to yield returns from cheaper transportation of ore, and to develop new ground. It is upon these claims that they must be justified since in Colorado, as elsewhere, repeated

take serious account of the possible revenue from drainage of wet mines. The Roosevelt tunnel, on the other hand, is primarily for drainage. It is to enable the orebodies to be followed downward another 740 ft. without the enormous expense of pumping. The Newhouse tunnel was begun in January, 1904, and has enjoyed but a halting rate of progress; periods of high-pressure work being followed by inactivity at the breast while negotiations were being conducted with some obdurate mine-owner. The Cripple Creek enterprise, on the other hand, has been driven forward almost steadily since its initiation. Apparently the two enterprises are to be completed at approximately the same date. The one will

give a new lease of life to Colorado's oldest gold camp, the other to its greatest.

At various periods since work on the Newhouse tunnel began, the methods of work have been changed either to reduce costs or to obtain greater speed in driving. Representative figures are available for work under three different systems. Details of the first were published in 1902.* For the two others they have been kindly supplied from the company books by George E. Collins, consulting engineer to the tunnel company. The Newhouse tunnel, formerly English owned, but now controlled by Boston stockholders, was designed to afford outlet to the mines of Gilpin county. These have attained a depth of approximately 2000 ft., measured on the vein, and show good ore at the bottom. The cost of pumping and hoisting, the lower grade of the ore, and the inadequate room and water for milling at Central City, all make such an outlet desirable. The portal of the tunnel is at Idaho Springs, in Clear Creek county, at an elevation of 7543 ft. and the tunnel is intended to run five miles slightly west of north. Something over four miles has now been driven and the breast is well under Nevadaville, in Gilpin county. Numerous veins have been cut and connection has been made with the surface through the Gem, Sun and Moon, Saratoga, and Old Town mines.

The rock in which the tunnel is driven is mainly granite-gneiss and mica-schist. Porphyry dikes occur and occasionally old conglomerates are found. In general the rock is exceedingly tough and gnarled, and the foliations dip away from the breast of the tunnel. The rock does not break beyond the bottom of the holes. The tunnel was begun by hand-labor, but power-drills were put in shortly after. At first these were used on one shift only, and a system was organized while Lafayette Hanchett was manager and S. A. Knowles foreman, which gave remarkable results. The drill crew worked only on day shift and remained on duty until the round was put in. The blasting was done by a second crew which also tore down the drills, laid pipe and track, and prepared the charges. A third crew followed and handled the broken rock, clearing up the breast and mounting the drills ready for the machine men. In order to make rapid progress by this method (and in fact excellent progress was made) it was necessary to drill and shoot long holes. Ten-foot holes were commonly drilled and 9 ft. at a round was broken steadily. This, of course, gave an immense amount of broken rock to handle, and made cleaning the breast slow work. It, however, took full advantage of the fact that much time is lost ordinarily in getting ready to drill and in tearing down after the round is in. In an eight-hour shift, as ordinarily organized, five hours or less are put in drilling. By the plan outlined full time was realized in the case of the most expensive men, the power plant had light duty except on one shift, and, since the blasting crew made all preparations before drilling was finished, there was ample opportunity for the smoke to clear without loss of time even of the cheaper men

working as shovelers. In order to hold the men to finish each round a particularly effective premium system of payment was devised whereby the men received increased wages in proportion to the work done at the same time that the cost to the company per foot fell. Without going into great detail it may be stated that by this method 2759½ ft. were driven in one year at a cost of \$28.80 per ft., and 2925 ft. another year at \$27.74. Of these sums the actual breaking costs, exclusive of permanent equipment, track, etc., were \$21.45 and \$19.68 respectively. The detailed cost per foot for a representative month may be quoted:

COST PER FOOT FOR MONTH ENDING AUGUST 31, 1909.

| | |
|--------------------------------------|--------|
| Labor: | |
| Drill crews and foremen..... | \$3.01 |
| Trammers, blasters, and drivers..... | 4.34 |
| Blacksmith shop | 1.03 |
| Engineers | 1.15 |
| Explosives | 4.55 |
| Oil and waste..... | 0.12 |
| Coal | 3.91 |
| Mules, feeding and shoeing..... | 0.32 |
| Drill repairs | 0.82 |
| Premiums | 1.87 |
| Tools | 0.33 |
| Timber | 0.16 |
| Track and material | 1.84 |
| Track—labor and repairs | 2.07 |
| Engineering and surveying | 0.22 |
| Salaries and office expenses | 1.97 |
| Legal expense | 0.07 |
| Insurance | 0.11 |
| Taxes | 0.12 |
| Minor items | 0.73 |

\$28.74

This work was done with Leyner drills, air at 160-lb. pressure. The holes were shot by battery, being loaded with 60% gelatine powder. The tunnel was double track and broken 12 by 12.

In 1902 the work was suspended and when again taken up a new plan was adopted. A contract was let to S. A. Knowles for breaking the rock, he furnishing labor and explosives. The cross-section was reduced to 9½ by 6 ft., except that provision was made for widening the tunnel at intervals to provide passing tracks. Under this contract between April 2 and December 31, 1906, 2128 ft. of advance was made including 360 ft. of double-track work. The minimum footage was 130 ft. in April, and the maximum 290 ft. in June. The average cost per foot is given below, the contractor being charged for air and transportation at the same rates as were other customers. As this afforded a small profit the actual expense was less than here given:

Cost per foot.

| | |
|--|---------|
| Contract price, including labor and ammunition.... | \$12.24 |
| Timbering and company labor..... | 0.15 |
| Power, compressed air, and ventilation..... | 2.41 |
| Blacksmith work | 1.72 |
| Drill repairs and steel..... | 1.38 |
| Other supplies furnished by the company..... | 1.09 |
| Transportation of rock and materials..... | 1.70 |
| Supervision and general expense..... | 0.92 |

\$21.61

In March, 1906, George E. Collins came to the company as consulting engineer and on the completion of the Knowles contract, took active charge as manager, a position he retained up to April 1909,

*H. F. Bain. 'Driving the Newhouse Tunnel', *The Engineering & Mining Journal*, April 19, 1902.

when R. B. Morton was made manager. In July, 1909, Mr. Morton resigned and the present organization, Mr. Collins, consulting engineer, R. C. Schirmer, assistant manager, Ralph Knowles, outside foreman, and Theo. Grasser, inside foreman, was effected.

The tunnel is now being driven with a 9½ by 5½ to 6-ft. cross-section, with wider cross-section to provide for passing tracks as needed, averaging about 200 ft. out of each 1000. The work is done on two shifts. The day shift includes a foreman, 2 drill-runners, 1 helper, 1 nipper, 4 shovelers, 1 trammer, 2 trackmen. The night shift is the same, except for the absence of foreman and trackmen. The shovelers go to work first and are expected to throw back enough rock so that the drill-men can put in a cross-bar over the top of the heap and go to work. The drill-men come to the portal at 6:30 a. m. They go in as far as the Saratoga station, where there is a dry-room, change clothes and then on to the face.



Newhouse Tunnel, Older Part.

They use two Leyner drills mounted on a cross-bar, and connect their air and water hose to a manifold on another bar across the face, about 8 ft. back, so as to keep the hose out of the way of the shovelers. Additional light bars are used to make a staging on which the drill-men stand and work. They drill about five hours actual time, putting in 20 to 22 holes involving 140 to 150 ft. of drilling, with air at 120 lb. pressure. The usual V-shaped centre cut is provided with holes looking down. In the meantime the shovelers work steadily, finally taking out the rock under the little platform on which the drillers work. The bar is then lowered and the bottom holes put in. The drills and steel are then loaded on a special car, pushed back out of the way, steel sheets laid, and the round blasted. Shooting usually comes about 3 p. m. In the bottom of each hole is put three sticks of blasting gelatine '100% powder'. This is followed by ordinary 40% dynamite, which is fired by cap and fuse, the cap being inserted in the dynamite

and the fuses cut so as to blast the cut first. The round broken varies from 4½ to 7 ft. The smoke is cleared by blower and high-pressure air from a 4-in. pipe. A mule is used in tramping back to the permanent track from which point an electric locomotive takes the cars in trains to the dump. Where the tunnel is to be broken wide for a passing track, one of the drills is turned to the side and puts in long holes looking away from the breast so as to slab off the side. The holes cost little extra and the additional width is gained cheaply. The method resembles in a way that used in railway work where a header is followed by bench drilling. The permanent track is laid close to the west wall, with 18-in. gauge, 35-lb. rails, and creosoted ties. To provide a water ditch the track is raised 12 to 18 inches and creosoted wooden blocks fitted in between the ties on the side next the ditch. By the new plan faster progress is made, and despite the greater distance from the portal, the cost per foot is less. The smaller cross-section allows only a single track, but this is ample for the traffic in this part of the tunnel.

Detailed distribution of costs for three months are given below:

| Items. | May. | June. | July. |
|---|---------|---------|---------|
| Labor | \$7.65 | \$5.59 | \$6.06 |
| Transportation | 1.42 | 1.34 | 1.34 |
| Power house — compressed | | | |
| air and blower | 2.15 | 1.79 | 1.86 |
| Blacksmithing | 2.35 | 1.18 | 1.22 |
| Explosives | 3.64 | 3.83 | 4.02 |
| Fuse and caps | 0.46 | 0.22 | 0.49 |
| Drill repairs | 1.24 | 1.02 | 0.93 |
| Use of machines and consumption of steel..... | 0.38 | 0.62 | 0.66 |
| Rail, ties, air for ventilation, pipes, broken wire.. | 1.59 | 1.58 | 1.66 |
| Sundries | 1.69 | 0.54 | 0.48 |
| Total | \$22.57 | \$17.71 | \$18.72 |

The footage and cost per foot for the early part of the present year are given below by the courtesy of Mr. Collins. In May the tunnel was being driven wide to provide for passing track. In June no permanent track was laid, and only the narrow cross-section maintained. In July there was 30 ft. of double track and some permanent track laying. In the same month three days were lost on account of the celebration of July 4.

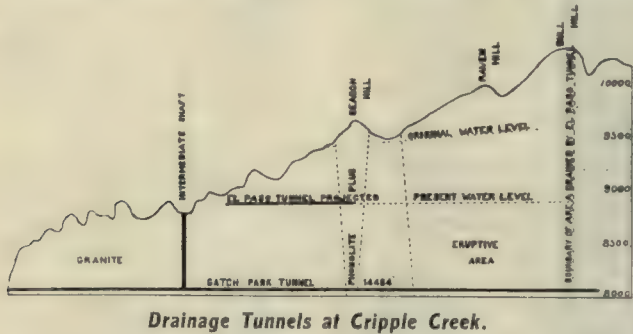
| | Distance. | Cost. |
|-----------|-----------|---------|
| January, | 291..... | \$22.66 |
| February, | 220..... | 20.41 |
| March, | 303..... | 17.48 |
| April, | 261..... | 22.87 |
| May, | 264..... | 22.57 |
| June, | 323..... | 17.71 |
| July, | 305..... | 18.72 |

As in the case of the previous figures the charges for power, transportation, and blacksmithing, are at the regular rates. The company now derives a substantial revenue from these charges, since there are a number of mines working through the tunnel. This includes the Gem, Saratoga, Old Town (connected with the tunnel by a 4000-ft. lateral), Sun and Moon, Druid (driving east through the Adduddel), Seaton Mountain, King Bee, Memphis and Idaho Springs, Gauntlet, and Adduddel. Veins be-

longing to a number of other companies have been cut, and arrangements for working them are being negotiated.

The Cripple Creek Drainage & Tunnel Co. was organized to drive a deep drainage tunnel to the heart of the productive district. For some time it had been apparent that the burden of pumping to reach lower horizons was bound to be a heavy one. The rocks which form the volcanic neck in which the veins of Cripple Creek occur, are so badly fissured and broken that the whole plug forms one vast sponge, and to work at any lower level, the ground-water throughout the area nearly three miles in diameter must be lowered. F. L. Ransome has figured that the discharge from one foot of subsidence in this district amounts to 35,000,000 gal. D. W. Brunton estimated that the various proposed tunnels would cost \$380,000 to \$570,000, or from \$628 to \$468 per vertical foot of depth drained, and would require 1.97 to 2.5 years to complete.

It was apparent that the task of providing drainage was peculiarly one for co-operative effort and accordingly after studies of the problem had been made by Seeley W. Mudd, D. W. Brunton, and others,



Drainage Tunnels at Cripple Creek.

it was determined to drive a deep-level tunnel. Stock in the tunnel project is held by the various mining companies somewhat in proportion to the supposed future distribution of benefits. In contrast with the stock in the Newhouse tunnel, it is not expected to pay dividends, and its purchase has been considered to be of the nature of an assessment. After 1400 ft. had been driven from the portal the further driving was contracted to A. E. Carlton at \$28 per ft., and since then nearly two miles of advance has been made. An intermediate shaft 650 ft. deep was sunk, it being opened September 15, 1908. For a time progress was made at three headings. In June, 1909, connection was made between the portal and the west drift from the shaft, since which time only one face has been available.

The cross-section of the tunnel-breast is 6 by 10 ft. A ditch 3 ft. deep is later excavated along one side, a single track being laid along the other. The pipe connecting with the blower is laid on top the ditch as are also the water and compressed air lines. The whole work is lighted by electricity. The rock through which the tunnel is cut is a blocky granite.

Work is organized in three shifts, each including drill-men, helpers, shovelers, and a driver. A mule is used for hauling the broken rock from the face to the shaft where it is hoisted in a self-dumping skip. Each crew includes 2 machine-runners, 2 helpers, 4 shovelers, and 1 machine-man working on the ditch. Leyner No. 7 drills are used, two in the breast and

one on a tripod at the ditch. The drill-men are paid \$4.50 per 8-hr. shift, and receive \$1 premium for each 5 ft. round broken with excess for more than 5 ft. The helpers get half as much premium as the machine-men. The holes are loaded with '100% powder' fired by means of one stick of Hercules powder primed with a 5X cap. The usual centre-cut system is used in breaking the ground. Since the work is done as a private contract, details of cost can not be published. Through the courtesy, however, of V. H. Mann, Mr. Carlton's assistant, I am permitted to give the following regarding the cost of supplies on the basis of an average for seven months:

| | Cost per foot. |
|--------------------------------|----------------|
| Powder | \$4.715 |
| Air-drills | 1.089 |
| Steel, shovels and picks | 1.505 |
| Candles | 0.178 |
| Oil and waste | 0.178 |
| Blacksmith supplies | 0.457 |

The rate of progress has been as follows:

| 1908. | Portal. | Shaft. |
|-------------------------|---------|-----------------|
| February 1 to April 1.. | 514 | ... |
| April | 262 | ... |
| May | 268 | ... |
| June | 187 | ... |
| July | 203 | ... |
| August | 303* | ... |
| September | 351 | ... |
| October | 287 | 49 1 heading. |
| November | 360 | 141 " |
| December | 334 | 177 " |
| 1909. | | |
| January | 435 | 261 " |
| February | 290 | 601 2 headings. |
| March | 340 | 639 " |
| April | 316 | 607 " |
| May | 402 | 552 " |
| June | 62 | 498 " |
| July | ... | 391 1 heading. |
| August | ... | 410 " |
| September | ... | 355 " |
| October | ... | 380 " |

*Began to use 100% powder.

Leyner drills were used at the portal from the first and at the shaft after January 15. The tunnel has now been driven 1140 ft., and has 3250 more to go. It is estimated that the breccia will be reached by September next, at which time the mines will begin to drain.

The Gunnison Reclamation tunnel, while not driven for mining purposes, was excavated by the same methods and is, therefore, to some extent comparable. It is 30,582 ft. long, and was begun in January, 1905, and finished July 6, 1909. A portion was driven by contract, but in the main, it was constructed by the engineers of the Reclamation Service.* It was cut through many different sorts of rock and methods were varied to meet the conditions. In the hard granite at the river portal, a heading 6 to 8 ft. high, and 12 wide, was carried with a 5 to 7 ft. bench. Sullivan 3-in. drills were used, four being mounted on two columns, each with a machine-man and helper. From 18 to 22 holes were necessary to a round. Three holes were used for the centre cut, 6 were 'relievers', 4 were side holes, 4 back holes, and

*For details, see I. W. McConnell, *Engineering Record*, August 28, 1909.

4 'lifters'. In addition 4 bench-holes looking down and away from the breast, were put in by an extra man with a tripod drill. At the breast each crew was expected to get in a round and clear the face in an 8-hr. shift. The bench was only broken on one shift. In other ground the organization was varied and Leyner drills were used. In the shale, Jeffrey coal augurs, air-driven, were employed and each crew got in two rounds of 12 holes per shift, there being two drills, with a runner and helper for each, on a shift. The rates of progress were extremely variable. In the shale, in 12 months ending July 1, 1906, 7500 ft. was driven with a three-shift organization. The best progress was 824 ft. For this ground 600 to 750 ft. per month was considered satisfactory. In the granite, in 1905, 384 ft. was undercut one month and in 1906, the full breast of the tunnel was advanced 392 ft. in one month. Later 449 ft. was made in one month. In general 300 ft. per month in the granite was regarded as good work. From the beginning to the end, the average progress was 566 ft. per month, or 255 ft. per 'gang-month'. The slowest progress was made in a belt of faulted ground where 50 ft. per month was considered very good. Many difficulties had to be overcome. In addition to heat and water, there were outflows of combustible gas and of carbon dioxide. An intermediate shaft was sunk to assist in the work and eventually a second had to be put down to secure adequate ventilation and temperatures low enough for good work.

The total cross-section inside the concrete lining, is 122 sq. ft. In driving this tunnel the methods were partly those of the mining engineer who drives either a full breast or a lower heading, and the railway engineer who drives an upper heading and carries a bench. In a general way the result seems to indicate that the choice of methods is properly determined by the area of the cross-section and in the case of the Reclamation tunnel, the area being between that of a railway and a mine tunnel, there was really small choice. The economy of driving by heading and bench where the cross-section will permit, is strikingly exemplified in one of the Wabash railway tunnels cited by H. P. Gillette,* where the costs per cubic yard were:

| | Heading. | Bench. |
|------------------|----------|--------|
| Drilling | \$0.48 | \$0.30 |
| Explosives | 0.30 | 0.20 |
| Mucking | 0.80 | 0.18 |
| Total | \$1.58 | \$0.68 |

It will be noted that while there is a slightly greater cost for drilling and shooting in the heading, due to the need of closer spacing of holes to break the same yardage, the big economy in bench-work comes from the cheaper handling of material, a direct result of the larger space. This reinforces the observation that greater speed in mine-tunnel driving is only to be obtained by better and speedier methods of handling the broken rock. Ground can now be drilled and broken faster than it can be cleared away. Gillette has suggested, arguing on the basis of experience in open-cut work, that in time mining

engineers may hope to decrease costs by working toward larger holes and heavier charges. If experience in mine-tunnel work is significant, there can be no question that at present the tendency is the other way. The remarkable improvement in drills has led to putting in smaller holes and more of them. The ground is thereby broken finer and the debris handled easier. So powerful and quick are the small drills now in use that the 2-shift and 3-shift systems are really economical and need no longer be defended on the basis of speed alone. In the cramped quarters of a mine-drift or cross-cut, short rounds and more of them are better. A satisfactory amount of drilling can be done even in the time left after 'mucking back'. A long drilling shift, such as was employed at the Newhouse in 1902, would result in more holes drilled than could be broken.

Chambering holes is also but little used underground and seems poorly adapted to small holes in hard, splintery ground, such as characterizes Western metal mines. The first explosion shatters the rock but packs it so tight in the hole that there is, with the means available, great loss of time in preparing a second shot. In some of the Lake Superior iron mines there is a tendency in the direction that Mr. Gillette indicates, as diamond-drills are used to put in long holes which are first 'sprung' and then shot with heavy charges. To most men with Western experience, however, the big stopes of the Lake Superior iron mines resemble out of doors more than a mine anyway, and until better means of handling material underground are perfected, it seems hardly likely that much effort will be expended in devising methods of shooting down larger blocks.

Standard hydrochloric acid solutions, according to Hulett and Bonner (*Jour. Am. Chem. Soc.* XXXI, p. 390), having a 'constant boiling' point is capable of use as a basis for volumetric work. Starting with an acid of almost any strength, and distilling, a point is soon reached where the degree of acidity in the retort and that condensed holds the same strength of acid. At 760 mm. pressure the density (at 25°C.) is 1.0962 and the strength 20.242% HCl, or 180.17 gm. of distillate will contain 36.47 gm. HCl. The boiling point is 108.54°C. The variations due to changes of barometric pressure likely to occur are not great. The table given is:

| Barometric pressure. | HCl, % | Gm. for 1 mol. HCl. |
|----------------------|--------|---------------------|
| 770 | 20.218 | 180.390 |
| 760 | 20.242 | 180.170 |
| 750 | 20.266 | 179.960 |
| 740 | 20.290 | 179.745 |
| 730 | 20.314 | 179.530 |

Starting with an acid of specific gravity 1.10 after distilling over three fourths, the succeeding distillate will not vary over 1 part in 1000 from the above figures.

A quick mode of decomposing minerals is to mix one part of the pulverized substance with one part of vaseline and 5 parts Na_2O_2 . Place the mass in a scorifier or on a thick iron plate and ignite with a match. On cooling, extract with water. The method is particularly suited for qualitative tests when in the field.

*Rock Excavation, p. 306.

PUBLIC LANDS AND NEEDED LEGISLATION.

By RICHARD A. BALLINGER.

*The proper use and disposition of the public lands have raised questions involving no little legislative as well as administrative difficulty from the beginning of their history. The lands were, during the earliest administrations, treated as a national asset for the liquidation of the public debt and as a source of reward for our soldiers and sailors. Not until the discovery of gold on the Pacific slope did the policy change for one of exploitation, by which our citizens were encouraged to develop the mineral and agricultural resources of the public domain on condition of receiving limited areas at a nominal cost. To the same end, railway and wagon-road grants were liberally donated by Congress in order to add facilities for the opening up of these almost inaccessible regions.

The railway grants generally were limited to non-mineral lands, except such as contained coal and iron, which latter minerals were taken to be essential for railway construction and operation. New States were, when admitted, liberally endowed with public lands for school and other purposes; so that, out of a public domain in 1860 of 1,055,911,288 acres (Alaska then not belonging to the United States), we now have only about 731,354,081 acres, confined largely to the mountain ranges and the arid and semi-arid plains, except lands within some of the Indian reservations and the 368,035,975 acres of undisposed of land in Alaska. All of the principal land statutes were enacted over 25 years ago; the homestead act, the pre-emption, and the timber-culture act, the coal-land, and the mining acts for the aid of the industrious prospector, were among the earlier acts of this nature.

The liberal and rapid disposition of the public lands under these statutes, and the lax methods of administration which for a long time prevailed, naturally provoked the feeling that the public domain was legitimate spoil for the unscrupulous, and that it was no crime to violate or circumvent the land laws. It is to be regretted that the nation has been so tardy in realizing the importance of preventing our natural resources passing into the hands of land pirates and speculators, with no view to development looking to the national welfare. It may be safely said that millions of acres of timber and other lands have been unlawfully obtained, and it is also true that actions to recover such lands have in most instances long since been barred by the statute of limitations. The principal awakening to our wasteful course came under Mr. Roosevelt's administration. The bold and vigorous prosecutions of land frauds, through E. A. Hitchcock and J. R. Garfield, have restored a salutary respect for the law, and the public mind has rapidly grasped the importance of safeguarding the further disposition of the public lands in the interest of the public good as against private greed.

In this present policy of conserving the natural resources of the public domain, while development

is the keynote, the best thought of the day is not that development shall be by national agencies, but that wise utilization shall be secured through private enterprise under national supervision and control. Therefore, if material progress is to be made in securing the best use of our remaining public lands, Congress must be called upon to enact remedial legislation.

In order that intelligence shall be used in the disposition of the public lands, it is essential that they be classified according to their principal value or use. They have generally been classified in legislation as agricultural, mineral, desert, timber, and coal lands, and it is only in recent years that the Interior Department, through the Geological Survey, has undertaken to make this classification in the field in the aid of the administration of the statutes, and then only through the general authority given in the organization of this bureau. Specific legislative authority should be given the department to classify and segregate our public lands according to their greatest apparent use, with the continuing power of re-classification to meet changing conditions and the increased knowledge of their character which may necessitate the transfer of lands from time to time from the one class to the other. Full legal effect should be given such classification when made so as to prevent entries, under laws applicable to one class, of land belonging to another class, except after application for and a review of the classification; in other words, if lands are classified as coal lands, they should be enterable only as coal lands, and in case it be shown that they are improperly classified as coal lands and are, in fact, agricultural, they should then be enterable only as agricultural lands. This, to my mind, is the only way the Government can scientifically and effectively proceed to conserve the natural resources of the public domain. To leave to the self-interest of applicants the option to claim a particular tract of land as more valuable for mineral, agriculture, timber, phosphate, oil, or gas, or for power sites, is to invite confusion, fraud, and contention, and this has been the source of a major portion of the difficulties of the Interior Department in administering the public domain. It may seem at the outset that this would be a radical departure, to the extent of suspending the disposition of public lands pending their classification, but, as a matter of fact, a large portion of the unsold public land has already been classified by the department, but such classification has not the authoritative basis or effect to accomplish the result above outlined.

As to minerals, other than those hereinafter specified, because of the manner of their occurrence, doubtless no effective classification can be made in advance of discovery, and they should for that reason be treated as an exception in classification and dealt with accordingly.

The present coal-land laws respecting the States and Territories, as well as Alaska, should be supplanted by an act fully meeting existing as well as future conditions. The inducements for much of the crime and fraud, both constructive and actual, committed under the present system can be pre-

*Abstract from Annual Report as Secretary of the Interior, for the year 1909.

vented by separating the right to mine from the title to the soil. The surface would thereby be open to entry under other laws according to its character and subject to the right to extract the coal. The object to be attained in any such legislation is to conserve the coal deposits as a public utility and to prevent monopoly or extortion in their disposition. This may be accomplished either through a leasing system, by which the title would remain in the Government, under proper regulation and supervision by the Secretary of the Interior, or through the sale of the deposits, and in either case with restrictions on their mining and use which would control the minimum output and conserve the deposits as a public utility. I believe the most advantageous method will be found in a measure authorizing the lease or sale of the coal deposits in the lands, subject to forfeiture if the rights granted be not exercised under any reasonable regulations imposed. An exploration period of at least one year upon a permit basis, at a nominal charge, would insure to the applicant the necessary preliminary knowledge upon which to make the lease or purchase of the coal deposits and venture the necessary investment for operation. The maximum unit authorized for this use could safely be made from three to five sections, provided no greater surface rights be granted than will give proper facilities to reach and extract the coal deposits. In case of failure of the lessees or grantees to open and operate the coal deposits under reasonable limitations and to maintain an output reasonably suited to the deposits, and in case of combinations as to price or limitation of output, title should be forfeited by proceedings in court for that purpose. Government mine supervision would doubtless be necessary to enforce the conditions and limitations under the grant.

The above suggestions with reference to the disposition of coal deposits are equally applicable to the oil and gas fields in the public domain, and similar legislation as to lands containing the same is hereby recommended. Indeed, the very nature of these two important mineral resources requires that their disposition be in terms of quantity of the product extracted rather than of acreage.

Pending the enactment of new legislation as affecting coal lands, all known coal areas were withdrawn from entry for classification and appraisalment through the Geological Survey. April 10, 1909, I changed to a practical and scientific basis the system of classification and valuation for disposition of coal lands under existing laws. For the purposes of classification and valuation, the coal deposits are divided into four classes in accordance with their fuel value and the thickness and depth of the coal beds. The prices of the lands are determined on the basis of an estimated tonnage and range from $\frac{1}{2}$ to 3c. per estimated ton, in accordance with the quality, thickness, and situation of the coal. Provision is also made for taking into consideration in making the valuation any special conditions enhancing the value of the land for coal mining purposes; also, for a review of the classification or valuation upon proper application and showing to the department.

The classification and appraisalment of the coal lands in the States and Territories other than Alaska proceed upon the authority of the act of March 2, 1873, which fixes the minimum price only for lands and leaves to the Secretary of the Interior their appraisalment and the determination of their maximum value. In view of the fact that the law of Alaska directs the disposition of the coal lands in that Territory at the flat rate of \$10 per acre, no such classification or appraisalment is warranted by existing law.

I have recently withdrawn temporarily, for the purpose of submitting the subject to Congress for new legislation, large areas of oil lands in Wyoming, California, Utah, and Oregon. I desire to call attention to the importance of asking Congress to authorize the Executive to reserve certain areas of these lands for the purpose of affording a supply of fuel oil for the future use of the navy, and to make such regulations as may be necessary for the preservation and extraction of such deposits. No legislation exists for the entry of oil and gas lands other than the general mining laws of the United States, which are not adaptable to the disposition of lands containing mineral oils and gas.

Under the previous administration there were temporarily withdrawn, pending action by Congress, 4,702,520 acres of land in the States of Wyoming, Idaho, and Utah, as containing phosphate deposits. These lands are being re-examined by the Geological Survey at my direction with a view to eliminating all tracts not containing such deposits. The area of the original withdrawals has now been reduced to 4,471,480 acres by the elimination of non-phosphate lands, and I am advised by the classifying officers that additional areas will be eliminated as a result of their examination. The lands containing phosphate are not adaptable to disposition, and should not be allowed to be disposed of as either placer or lode mineral claims, but the deposits should be leased or sold in limited areas and on conditions preventing monopoly and insuring domestic use.

In anticipation of new legislation by Congress to prevent the acquisition of power sites on the public domain by private persons or corporations with the view of monopolizing or adversely controlling them against the public interest, there have been temporarily withdrawn from all forms of entry approximately 603,355 acres, covering all locations known to possess power possibilities on unappropriated lands outside of national forests. Without such withdrawals these sites would be enterable under existing laws, and their patenting would leave the General Government powerless to impose any limitations as to their use. If the Federal Government desires to exercise control or supervision over water-power development on the public domain, it can only do so by limitations imposed upon the disposal of power and reservoir sites upon the public lands, the waters of the streams being subject to State jurisdiction in their appropriation and beneficial use. I would, therefore, advise that the Congress be asked to enact a measure that will authorize the classification of all lands capable of being used for water-power development, and to direct their dis-

posals, through this department, under substantially the following conditions: (1) That the title to such lands be reserved in the Federal Government, and only an easement granted for the purpose of developing and transmitting electrical power for private and public use, and for the storage of waters for power, irrigation, and other uses. (2) That such easement be granted for a limited period, with a maximum of at least 30 years, and the option of renewal for stated periods upon agreed terms. (3) That entry shall be accompanied by plans and specifications covering the works sought to be installed, and covering the maximum horse-power capable of development at such site; also, that a substantial entry fee be paid to show good faith, and that a transfer to the United States of the necessary water rights to permit of the estimated power development be made. (4) That the construction period allowed entrymen for the development of at least 25% of such power shall not extend beyond four years, or such further time as may be granted by the Secretary of the Interior upon a proper showing. (5) That a moderate charge shall be made on the capital invested, or upon the gross earnings of the project for the first ten years of operation, adjusted at each subsequent ten-year period, and equitably determined by appraisalment. (6) That all rights and easements shall be forfeitable for failure to make development within the limitations imposed or upon entry into any contract or combination to charge or fix rates beyond a reasonable profit on the investment and cost of operation, or entry into any agreement or combination to limit the supply of electrical current, or failure to operate the plant. (7) That all books and accounts shall always be subject to the inspection of the department.

Unreasonable or narrow restrictions beyond the necessity of public protection against monopoly, or extortion in charges, will, of course, defeat development and serve no useful purpose. The statute should, therefore, while giving full public protection against the abuses of the privileges extended, so far as consistent, encourage investment in these projects; and it must always be borne in mind that excessive charges for the franchise will fall upon the consumer. Legislation of this character proceeds upon the theory that Congress can impose such contractual terms and conditions as it sees fit in the sale or use permitted of Government lands so long as such limitations do not conflict with the powers properly exercised by the State wherein they may be situated.

Alaska has now a permanent white population estimated at 33,000. There are in addition 7000 employed in the mines, canneries, and in railroad construction who are transients, and about 35,000 natives. Coal is widely distributed throughout the district, but up to the present time practically no production has occurred and no patents for coal lands have been issued. One hundred and sixty-five miles of wagon roads, 383 miles of sled roads, and 241 miles of trail have been constructed, at an approximate cost of \$690,000.

The rapid development of the mineral wealth of Alaska and the establishment of transportation fa-

cilities is attracting and will continue to attract a constantly increasing permanent population to the district. This creates an increased demand for agricultural products, which can be met in part by local production provided proper encouragement is given to the settler to enter, improve, and develop lands suitable for agriculture and grazing. The approximate area of agricultural and grazing lands ranges from 16,700 to 28,000 sq. mi., and the known coal fields embrace about 12,000 sq. mi., of which about 7000 could be covered by a system of surveys planned to include the agricultural and grazing lands mentioned. It is very important, in the interest of agricultural development, that the system of public-land surveys be extended over lands of this character, as, in the absence of such surveys, the present cost of acquiring title under the homestead laws is prohibitive except in the most favored localities.

The lands described are widely distributed over a region containing some 200,000 square miles; the cost of surveys in this field will be large because of the high cost of transportation and the shortness of the open season, and to promote the development and encourage the settlers it is important that results should be obtained at the earliest possible date. Many of the difficulties which would attend the making of surveys in the manner now in vogue in the United States proper can be avoided by providing for a geodetic control of surveys through triangulation. This will enable the taking up of sub-divisional work in the most important areas first, and yet the entire area can be included in one system of surveys. With a slight additional cost the triangulation can be extended into the important mining districts and monuments established to which all private surveys for land may be connected, thus avoiding litigation and confusion in the future on questions relating to boundaries. The geodetic methods of survey have been applied in the sub-divisional survey work of various Indian land surveys during the past 20 years and have worked expeditiously and successfully. I, therefore, respectfully recommend that the necessary appropriations be made for the initiation of this most important work, and that the Secretary of the Interior be authorized to carry on these surveys by engineers in his department.

WORLD'S PETROLEUM PRODUCTION.

The following table shows the world's production of crude petroleum in 1904 and 1908 and the share of the United States and other countries, according to figures compiled by the United States Geological Survey:

| Countries. | 1904. | | 1908. | |
|-----------------------------|--------------|-----------|--------------|-----------|
| | Million bbl. | Per cent. | Million bbl. | Per cent. |
| United States | 117.1 | 53.4 | 179.6 | 63.1 |
| Russia | 78.5 | 35.8 | 62.2 | 21.9 |
| Sumatra, Java, and Borneo.. | 7.7 | 3.5 | 8.8 | 3.1 |
| Galicia | 5.9 | 2.7 | 12.6 | 4.4 |
| Rumania | 3.6 | 1.6 | 8.3 | 2.9 |
| India | 3.4 | 1.5 | 5.0 | 1.8 |
| Japan | 1.4 | 0.7 | 2.1 | 0.7 |
| Mexico | ... | ... | 3.5 | 1.2 |
| All other | 1.7 | 0.8 | 2.5 | 0.9 |
| Total | 219.3 | 100.0 | 284.6 | 100.0 |

OUTCROP OF OREBODIES.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM H. EMMONS.*

The outcrops of orebodies are of special interest since it is through them that most deposits are discovered. Now and then a 'blind lode' is uncovered by a chance excavation, or through some fortuitous circumstance the true character of an outcrop may be recognized. Such was the case at Cobalt, where the first discoveries were made while grading for a railroad, but chance discoveries are rare indeed, compared with those which are made by prospectors with whom exploration is a business. The discovery of the outcrop of the ore, and the first recognition of its meaning, are events of prime importance in connection with the economic history of a mining district, and as a rule one may learn a good deal about the outcrop of the ore first discovered by referring to a reliable history of the district. Although there are orebodies which do not outcrop, most of these are discovered after the value of outcropping deposits has been proved in the same district. It is not considered good practice to attempt deep exploration unless there are exposures in the district at the surface or in the shallow workings which promise reward for deeper and more expensive prospecting.

Outcrops are interesting also because these portions of the deposits have had, as a rule, a more eventful geological history than any other part, and they are situated at the surface of the earth where changes are most rapid. An outcrop may represent a portion of the deposit which has once been primary ore and which later has become the zone of sulphide enrichment; at a still later date, the zone of oxidized sulphides; and later still the zone of leached oxides. Last of all, as the surface is worn away, the deposit also is denuded. The component materials are broken up and carried away, either in solution or mechanically. If in solution, they may enrich the deposit lower down, or they may join the general surface circulation and be scattered. If they are removed mechanically the heavier portions may accumulate as placers, or if the conditions for this are unfavorable they may be lost. Thus the cycle is completed. The study of outcrops is a study of the effects of weathering and erosion of ore deposits. The effects of weathering are shown in the topographic expression of the outcrop, and in the composition of the oxidized zone, in general, and with respect to value.

The topographic expression of lode-deposits depends upon the difference in the rates at which the deposit and the country rock are eroded. If the deposit is more resistant to erosion than the country rock, the latter will be removed more rapidly and the lode may outcrop as a ridge or knob. If the country rock is more resistant than the orebody, then the deposit may occur at the bottom of a slight depression where blocks of hard vein-quartz are mingled with the rock débris. If there is no marked difference between the rate of weathering of the deposit and the rate of weathering of the country rock, the deposits may be found in any topographic position, and for the

lode-deposits of the western part of the United States, this is most common. There seldom is here a conspicuous relationship between the outcrop of the deposits and the large features of the topography, although in many California camps, and in some of the Nevada camps, as at Goldfield and at Mineral Hill, some of the minor features of the relief may be controlled by the lodes.

It is not unusual to find differences in the character of topographic expression of the deposits of a single district, or even in a single lode. At one place it may outcrop as a ridge, in another along a ravine. The difference must be great before considerable permanent relief is established, for the rock of a ridge is in an exposed position, and is, therefore, the more readily attacked by agents of weathering. The great majority of the orebodies are lode-deposits. They are for the most part rudely tabular, and there is accordingly a tendency for their intersection with the surface to be expressed as a line usually curved,



Fig. 1. Outcrop of a Lode in Steins Pass District, New Mexico.

(Photo., Graton, U. S. G. S.)

the curvature depending upon the topography and the dip of the lode, or upon an actual bend of the lode along the strike. The relief is variable, and is an expression of the relative rate of erosion of the lode and country rock. Fig. 1 shows a conspicuously outcropping lode.

With respect to the ratio of the rates of erosion of the lode-deposits and the country rock, it is unsafe to make too sweeping generalizations, for the rate of erosion of each depends upon many variables aside from composition; but there are some more or less constant features which should be recognized. For the sake of comparison the deposits may be loosely grouped as follows:

- (1.) Silicious lodes in limestone or other soluble or easily eroded rocks.
- (2.) Pyrite-rich lodes in limestone or other soluble rocks.
- (3.) Silicious deposits in igneous rocks (granites, porphyries, etc.).
- (4.) Quartz-pyrite lodes in granites or in porphyries.
- (5.) Silicious deposits in quartzites.

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(6.) Pyrite-rich deposits in quartzites.

(1.) As a rule the highly silicious ores in limestone and other soluble rocks outcrop conspicuously above the surrounding country. The difference in the rate of erosion of the ore and country rock is probably a maximum for such deposits, consequently these deposits are often the first to be recognized, and many camps in the western part of the United States owe their discovery to them. The Hope mine, at Philipsburg, Montana; the Mineral Hill mine, in Eureka county, Nevada; the original Bullfrog mine at Bullfrog, Nevada; (Fig. 2), the quartz outcrops in serpentine along the Mother Lode of California; some of the lodes of the San Juan in Colorado, and many other deposits, may be cited as examples of boldly outcropping quartz bodies which are bounded on one or both sides by limestone or by other rocks which are eroded at a relatively rapid rate. Most of these deposits contain a high percentage of quartz, and the ore commonly contains more than 90% silica. If the calcareous wall-rock has undergone much metamorphism it is more resistant to erosion than before, and the outcrops are usually less conspicuous.

(2.) As pyrite increases in such deposits the outcrop is likely to be less conspicuous. The pyrite alters to the hydrous iron oxide, limonite. This alteration is attended by a loss of sulphur and some iron, which substances are removed as iron sulphate; there is also an addition of oxygen and water. As a result there is a loss of volume, as is shown by pseudomorphs of limonite after pyrite, which when broken open are usually found to be cellular. Although limonite is relatively insoluble in the common underground waters—perhaps even less soluble than silica, the oxidation may leave a powdery mass which is easily washed away, and as a result the pyritic cropping is nearly always less resistant than the limestone wall-rock. Accordingly the highly pyritic deposits will outcrop in slight depressions or on hillsides. Lodes of highly pyritic gold ore and pyritic copper seldom stand up conspicuously above the surface of limestone, but are recognized from the color of the surface rather than its relief.

(3.) Silicious deposits in igneous rocks are eroded by earth-waters at a rate which on the whole is little less rapid than the erosion of the country rock. As a result such deposits are likely to outcrop above the general surface, but the outcrops are not so conspicuous as those of the silicious deposits in limestone. The difference is not so great as the difference between the erosion of silicious ores in limestone, nor is it so nearly uniform. It depends in a larger measure upon the extent to which the silicious lode has been fractured since it was deposited, and if fracturing has been extensive, such a deposit may be eroded at a more rapid rate than the igneous rock; indeed, a part of such a deposit may form a conspicuous depression, especially where the lode crosses a ridge, although other portions in which the ore is less fractured may outcrop a little above the surface. On the other hand, certain kinds of hydrothermal metamorphism of the igneous rock, and structural features such as jointing, sheeting, and vesicularity, may make it more easily eroded and then the deposit may outcrop as a ridge. An outcrop

of a silicious orebody in eruptive rocks is illustrated in Fig. 3.

(4.) Pyritic lodes in igneous rocks are usually eroded more rapidly than the rock. As pyrite increases in the lodes which cut the porphyries and other igneous rocks, their outcrop becomes less conspicuous, and if much pyrite is present these deposits are likely to lie a few feet below the level of the country. Between the silicious and pyritic lodes is a great class of deposits which carry considerable quartz and also a notable amount of pyrite, and such deposits are likely to be eroded at about the same rate as the country. Outcrops of this character are numerous, and perhaps they exceed all others. The presence of the lode is not indicated by any constant topographic feature. At most places there is not the slightest ridge or the faintest depression, but here and there, perhaps, or at only one place along the lode, the adjacent country rock may have been ground up by movement, which nearly everywhere follows the walls of the veins more or less closely. If the post-mineral fissuring has left the vein for the country rock in only one favorable place, that circumstance may be responsible for a little more rapid erosion at that place, making an exposure of the lode. Many of these lodes are found where they are crossed by small canyons or in cliff exposures due to other causes, or by following float up the hillside and trenching here and there for the lode, or again by investigating small depressions or other areas in which the loose soil and rock are stained by limonite. Butte and Granite, in Montana, afford good examples of lodes in igneous rocks which may at one place outcrop just a trifle above the general surface, but which at other places on the same lode may be found below a slight depression. In both these districts there has been considerable post-mineral fissuring which in the main follows the lodes. With a few exceptions there are no long continuous outcrops of lodes in either of these camps. Here and there a slight depression may mark the apex of the lode, but at most places there is not enough difference between the rate of erosion of the ore and country rock to find expression in the topography.

(5.) Silicious deposits in quartzite weather at about the same rate as the quartzite, and the problem of their discovery is similar to that of the lodes just considered.

(6.) If, however, there is a notable amount of pyrite in the ore it weathers more rapidly than the quartzite, and as a result the apex of the deposit is obscured. Quartzite, on account of its erosion-resisting qualities, is an unfavorable rock for ore outcrops, and this fact, together with its comparative insolubility in most replacing solutions, probably justifies the prejudice against it which exists in the mind of the prospector. While a few important deposits have been found in quartzite, their number is small, indeed, compared to the deposits which have been discovered in limestone and in igneous rocks. Perhaps this difference is emphasized in no small degree by the unfavorable conditions controlling outcrops.

Orebody which are less resistant to weathering

processes than the country rock are, as already stated, difficult to find. A long depression in such a position that it does not seem to be a natural drainage-channel may cover such a deposit and should be trenched for investigation. When deposits of this nature have been found and followed a short distance underground it is good practice to outline with pegs the trace or apex of the orebody on the surface, and to peg out in both directions the position which the orebody would take if its dip and strike remain unchanged. In this way it may be followed through outcrops of country rock and over grassy unexposed portions of the surface, and by trenching it may be found. In a hilly country with veins which are not vertical, it is convenient to use a plane-table and a flat board for sighting. The table is placed on the apex of the lode and leveled. A thin board is trimmed to an angle corresponding to the dip of the vein and a second rectangular board is placed against this on the plane-table so that its upper edge points in the direction of the strike of the lode. It is then oriented exactly with the lode, and by sighting along it pegs may be driven anywhere on the hillside, and should be exactly on the apex of the extension of the lode providing its attitude remains unchanged. If its attitude does change, the change is often shown by outcrops of country rock in the strike of the extension shown by sighting along the board.

Changes in depth as indicated by outcrops. To some extent the difference in the rate of erosion of the ore and country rock may give a hint as to the relative size of the lode in depth. If the deposit varies greatly in width down the dip and if it is eroded much less rapidly than the country rock, then in a majority of cases its width will decrease in depth. If, on the other hand, the country rock is eroded less rapidly than the deposit and the lode varies in width down the dip, its width will increase in a majority of cases. If the lode is very resistant and the country rock easily eroded, then the lode

rock and outcrops as a ridge. The solid line, which is an erosion-surface showing a maximum amount of the hard rock, may be called a permanent surface, while the dotted line, showing a maximum amount of the soft rock, may be called a temporary surface.



Fig. 3. Surface Workings of the Anaconda Vein, Cripple Creek, Colorado.

The lode is a sheeted zone of silicious tellurium ore and the country rock is volcanic breccia.

(U. S. G. S. After Lindgren and Ransome.)

If, on the other hand, the deposit be less resistant than the country rock, and if it vary in width down the dip, the narrow portion is likely to remain at the surface longer, as shown by Fig. 7, where the

solid line represents the 'permanent' outcrop, and the dotted line the 'temporary' outcrop. Such a deposit is likely to increase in size as it is followed downward. In other words, the erosion is such that a maximum amount of the most resistant material, be it ore or country rock, tends to remain longest at the surface, and as far as possible to monopolize the outcrop. Not all, but the majority of such deposits will increase in size with depth. Examples where large masses of quartz outcropping in limestone are underlaid by relatively small bodies of quartz in limestone are common. Among such deposits are the lodes of Mineral Hill, Nevada, the Cadgie Taylor mine, Montana, and many other deposits of silicious ore in soluble rocks.

On the other hand, some of the soft lodes of fissured decomposed quartz and clay which outcrop at Bullfrog, Nevada, in relatively resistant rhyolite, have shown a fairly consistent tendency to increase in width down the dip of the deposit from the apex to near the bottom of the oxidized zone.

Composition of outcrops and leached zones. Since



Fig. 2. Outcrop of Original Bullfrog Lode.

The small hill in the foreground is composed in part of solid quartz which dips at an angle. The country rock is rhyolite and limestone.

(U. S. G. S. After Ransome, Emmons, and Garrey.)

outcrops above the surface, and the wider part of the lode will outcrop for a longer period of time than the narrower part, hence, if there be several deposits of this character, most of them will be found at a time when a maximum amount of the hard rock is exposed to erosion. Fig. 6 illustrates this case. The lode is more resistant to erosion than the country

pyrite is an important constituent in nearly all primary gold, silver, and copper ores, the color of the oxidized outcrop is red or brownish yellow, depending upon the amount of limonite present. Brown shades may be shown locally, due to manganese stains, as at Bullfrog and Manhattan, Nevada; or if this oxide is in great quantity the color may be black, as at the outcrops of some deposits at Philipsburg, Montana. The composition of the oxidized zones is discussed authoritatively by R. A. F. Penrose, Jr., in his paper on the 'Surface Alterations of Ore Deposits'.¹ The minerals of the outcrops and oxidized zones are the residual primary minerals which remain behind owing to their relative insolubility and to the secondary minerals formed by oxidation and kindred processes. The residual minerals are essentially those which commonly occur in placers, and include gold, platinum, cassiterite, rutile, zircon, and some gems. In addition to these minerals galena and quartz are often found. These substances are much less soluble than pyrite, zinc blende, and antimony sulphide, and so may be found as small remnants at or near the surface, mingled with the minerals of the oxide-zone, and at some places they may be found in placers.

Magnetite and specularite resist the agents of

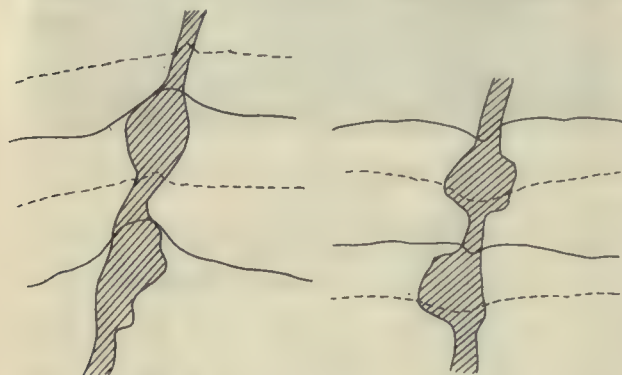


Fig. 6.

Cross section of a lode which varies in width down the dip and which is more resistant to erosion than the country rock. The solid lines show the 'permanent' surface. The dotted lines show the 'temporary' surface.

Fig. 7.

Cross section of a lode which varies in width down the dip and which is less resistant to erosion than the country rock. The solid lines represent the 'permanent', the dotted lines the 'temporary' surface.

weathering longer than pyrite, and in deposits where the three occur together the magnetite and pyrite may appear at the outcrop, together with a considerable quantity of limonite, which is an alteration product from pyrite. The pseudomorphs of limonite after pyrite may be intergrown with the residual magnetite. Galena is dissolved slowly and is often found in an unaltered condition. Enargite seems to be one of the most insoluble minerals and so in the few deposits where it is a primary mineral it may appear in or just below the outcrop. At places in Tintic, Utah, according to L. C. Graton, pyrite, chalcocopyrite, and other sulphides have been dissolved out of the higher zones, and galena and enargite only remain. At other places enargite remains and galena has been dissolved.

Secondary minerals formed in the oxidized zone by oxidation and kindred processes are given below. The amounts of these minerals vary greatly, depend-

ing upon the composition of the ore before oxidation, upon the relative solubility of the minerals, and upon the earth-waters causing weathering, the nature of the country rock, and upon other conditions and processes.

Native elements: Amalgam, antimony, arsenic, bismuth, copper, gold, lead, mercury, silver, sulphur, tin.

Oxides: Bauxite, cuprite, hematite, kaolin, limonite, magnetite, melaconite, molybdate, psilomelane, pyrolusite, turgite.

Sulphates: Alum, alunite, caledonite, celestite, chalcantite, goslarite, leadhillite, gypsum (barite and strontianite in part).

Carbonates: (Ankerite), aragonite, aurichalcite, azurite, calcite, cerussite, dolomite, hydrozincite, leadhillite, siderite, smithsonite, witherite, magnesite.

Silicates: Calamine, chalcedony, chrysocolla, chert, opal.

Phosphates: Pyromorphite, pseudomalachite.

Chlorides: Cerargyrite, pyromorphite, alacamite, bromyrite, calomel.

Many of these minerals are the result of the oxidation of the primary sulphide ore, but some result from oxidation, reduction, or chloridation of the secondary sulphides. This is true in a large measure of the rich copper and silver minerals.

Extent of the oxidized zone. In countries which have been glaciated in the last glacial period the sulphide ores often outcrop at the surface. In Alaska and in New England, where the ice erosion was vigorous, such outcrops are most common. If any extensive oxidation took place below the ice the oxidized ore was removed by ice-erosion.

For countries which have not been recently glaciated the vertical extent of the oxidized zone depends, in a broad way, upon the depth of the water-table below the surface. Oxidation may take place below the water-table, but this is not often pronounced, and may be regarded as an interesting feature rather than as an economically important one. Often, the bottom of the oxidized zone is above the water-table. This is particularly the case where the lode is little fractured. It is likewise true where the water-table has lately been depressed through change of climate to aridity, as in the Great Basin of the United States, or where stream beds through which the lodes are drained are being rapidly lowered by erosion, as is often the case in mountainous regions. Indeed it is common to find the sulphide ores marooned high above the water-table, and these may oxidize in place to rich silver and copper minerals. S. F. Emmons² has divided the oxidized zone into two sub-zones, the lower zone of rich oxidized ore, and the upper zone of leached oxides. The depth of the latter is controlled to some extent by the position of the water-table, but depends mainly upon processes of leaching which are discussed below. The presence of this zone is quite generally recognized, but data relating to its depth are obviously of considerable importance, especially to the prospector or to the miner who is engaged in opening a property.

(To be Continued)

¹Jour. Geol. II, p. 288.

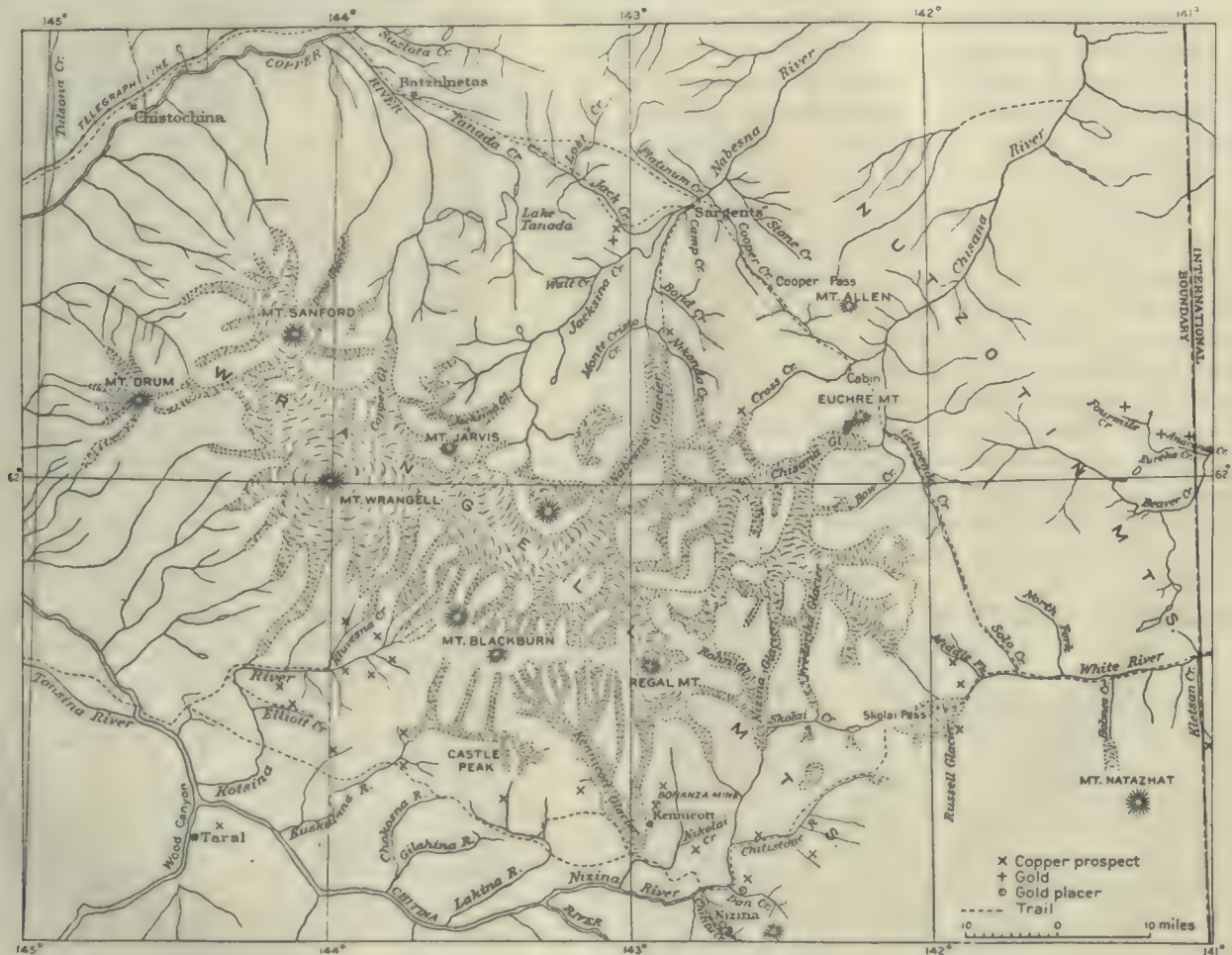
²Trans. A. I. M. E. XXX, p. 177

WHITE RIVER COPPER PROPERTIES.

Written for the MINING AND SCIENTIFIC PRESS
By GUY A. R. LEWINGTON.

Convincing indications of an era of development are now shown on the upper White river properties, where primary native copper occurs in the amygdulose of zeolitic amygdaloids, traceable along the north-east side of the Wrangell mountains for more than five miles. The principal locations at present are the Jack Dalton, the Bob Wiley, and the Boorman group. The last is represented on the ground by two men, Sinclair and Hutchings, who were the first to

cuprite, and traces of gold and silver have been found at this point. From surface indications there appears to be a zone of copper minerals of considerable magnitude in this particular region. Near the International boundary line, and on the Canadian side, is what is known as Discovery claim. Henry Bratnober has visited it several times. A good showing is to be seen here. Many claims have been located around Discovery, but little development has been done to date. On Rabbit creek, at a point near the Boundary line, and about five miles north of White river, is a prominent outcrop about 40 ft. wide, iron-stained, with blue and green carbonates of cop-



Map Showing White River District, Alaska.

(After U. S. G. S.)

leave Dawson last spring for the purpose of doing development work. They left on March 10 and took with them 6000 lb. of supplies, and they will continue development through the coming winter. The Boorman group is represented by 19 locations. The croppings on all of these properties occur at an elevation of about 5000 ft., or 1500 ft. above the creek level, and are situated some 40 miles east of the famous Bonanza group on the Nizina, a tributary of the Copper river. The latter property is controlled by the Guggenheims and J. P. Morgan, and they are spending \$20,000,000 in development, including the railroad up the Copper river.

Most of the development work is being done on the line of the Washington and Red Fox claims on Moraine creek by Sinclair and Hutchings, who are driving an adit to tap the outcrop some 50 ft. in depth. High-grade ore with native copper and

per and chalcopyrite. Some 30 ft. of tunnel has been run.

At Benson, on Beaver creek, a tributary of Snag, about 35 miles north of White river, a number of strong veins of free-milling gold ore are situated and some development has been done. These camps are awaiting the construction of the Copper River & North Western railroad over Seoli pass, which will enable supplies to be delivered. There is another favorable route for a railroad from the coast, with a deep-water harbor at Haines mission on Lynn Canal, the highest divide being approximately 3250 ft. above sea-level, with comparatively easy grades and plenty of timber. This route is worthy of consideration in the development of this part of Alaska and of the Yukon Territory, it would open much valuable country that cannot well be reached by any railroad now building, or, so far as I know, contemplated.

This region offers a promising tonnage for more than one road, as there is an immense stretch of country that is undoubtedly rich in minerals.

The White river, which empties into the Yukon some 90 miles above Dawson, has proved navigable for small steamers for a distance of 150 miles, the steamer *La France* (one of the smallest Yukon river boats) having made a trip this summer of 100 miles up-stream, and later the *Pauline*, a somewhat smaller boat, managed to get up 150 miles. A light-draft steamer, drawing about 15 in., with good power and a capacity of 20 tons, can, it is now felt, reach the copper mines on the White river, and possibly Kluane lake, where good placer diggings exist. Freight rates are now 20c. to Kluane, and 50c. per pound to the head of White river.

All the properties at the head of the White river are distant from White Horse about 300 miles; from Coffee creek on the Yukon river it is about 150 miles; and from Dawson to the head of navigation by steamer on the White leaves only a distance of 50 miles of trail. This last would seem to be the best way to get in during the summer season, but so far there is no boat on this run, and it cannot be depended on. The Coffee creek trail has not been much traveled, so that any one contemplating a summer trip to this district should go in from White Horse, as there is a good wagon-road more than half the way, and a well traveled trail the remainder. In all cases a stranger should have a guide. There is scarcely any doubt that this part of the Yukon Territory and Alaska has a great future.

RELATIVE MERITS OF ACID AND BASIC PROCESSES.

The quality and supply of iron will determine the method adopted for converting it into steel. It costs more to convert steel in the basic furnace, because repeated re-working is necessary. The acid process is easier to control, and there is greater certainty as to the composition of the steel. The acid furnaces would undoubtedly predominate if the larger part of the iron supply were low in phosphorus. But such is not the condition in the United States. Most of the low phosphorus iron is treated in bessemer converters, and the supply of bessemer ores is rapidly being exhausted. No new important discoveries are being made. High phosphorus iron is cheaper and more abundant, and there is an ever increasing supply of scrap which is unsuitable for the acid treatment. Thus the higher cost of the basic process is offset. As to the quality of the steel, it may be said that while the stock is superior to begin with and the product more even in the acid process, just as good, and even better steel may be made by the basic process. The danger of overheating while the heat is prolonged for the removal of phosphorus may be guarded against by proper management. The basic furnaces now greatly outnumber the acid.

Tungstic acid may be separated from silica by heating the material in a current of air and chloroform vapor to 500°C. The W is vaporized and passes off as a mixture of oxychlorides, which may be condensed in a suitable receiver.

CYANIDATION OF MANGANESE SILVER ORES.

By E. M. HAMILTON.

*When I first attempted to treat manganiferous silver ores I did not suspect an intimate association of the silver with the manganese, though I knew both were present. I tried cyanidation with all strengths of cyanide, even up to 5%, on samples of the ore ground to pass a 200-mesh screen, and could only extract 5 to 15% of the silver. I tried the addition of all kinds of reagents, such as lead-salts, oxidizers, chlorides, oxygenation with air, and hot solutions, without effect. I then started a course of reasoning somewhat as follows: I ascertained that this insoluble silver was contained principally in the surface-ore between the croppings and the 200-ft. level, while ore from the bottom of the mine would yield 90 to 95% of the silver without any trouble. The ore in each case appeared to be quite similar, except that the surface-rock which gave trouble was highly oxidized. Then it occurred to me that if I could reverse this condition and treat the oxidized ore with a reducing agent I might get a result similar to that obtained on the lower-level ore from the sulphide zone. I accordingly subjected the finely ground ore to treatment with solutions of various reducing agents, among which were hydrogen sulphide, sodium sulphide, sodium hydro-sulphide, ammonium hydro-sulphide, and roasting with sulphur in a closed vessel. The charges were agitated for about 24 hours and then well washed with water, and cyanided by agitation in bottles. The sodium sulphide had no effect whatever, but both the ammonium and sodium hydro-sulphides, and the hydrogen sulphide, increased the subsequent silver extraction to about 73, against about 5% by straight cyaniding. The cyanide consumption was also increased from about ½ lb. per ton in straight cyaniding to 12 lb. per ton for the samples treated by hydro-sulphide, and to 27 lb. for that treated by hydrogen sulphide. The resultant cyanide solutions carried large quantities of thiocyanate. The samples roasted with sulphur gave about the same yield as those treated with hydro-sulphide and about the same cyanide consumption. To try to reduce this heavy loss of cyanide the ore after reduction treatment was given various treatments before cyanidation, among which were the application of chlorine water and various chlorides and oxidizers, such as potassium permanganate and hydrogen peroxide, and also the blowing of air through the pulp. They were then well washed before cyanidation. In the case of the intermediate oxidation tests some cyanide was saved in the subsequent treatment, but the extraction of silver was considerably less than when the ore was cyanided immediately after the reduction treatment. The intermediate chlorine treatment made no difference in the cyanide consumption, but increased the silver extraction by 3 or 4 per cent.

Owing to the excessive cyanide consumption and the low value of the ore (\$8 to \$10 per ton) this method of treatment by reducing agents could not be entertained, although, if the cyanide loss had been

*Abstract from *Jour. Chem. Met. & Min. Soc. of S. A.*

normal, the method would have been well worth considering. The reason why this treatment increased the silver extraction was rather mysterious, and attempts were then made to ascertain the mode of occurrence of the silver. By grinding the ore to pass a 200-mesh screen, and boiling for an hour in strong nitric acid, then washing well with distilled water, and assaying the residue, the latter was still found to contain 75% of the original silver content. This residual silver, insoluble in nitric acid, could not have been in the metallic or sulphide forms, nor was it mechanically inaccessible in the ordinary sense, because a sample of the pure clay-slime from the ore was even more refractory to nitric acid than the general sample. It might have been in a haloid form, but in that event it should have been soluble in cyanide or sodium thio-sulphate, which reagents had practically no effect on it. At about this stage of the enquiry I obtained the assistance of G. H. Clevenger, who made many experiments, of which the following is a short summary: (1) bromo-cyanide, results rather inferior to those by straight treatment; (2) addition of zinc-dust as a reducing agent, no result; (3) addition of metallic sulphides with a view to breaking up any hypothetical haloid compounds, no result; (4) addition of strong alkali, with and preliminary to cyanide treatment, no result; (5) preliminary treatment by pan amalgamation, no result; (6) preliminary treatment with chlorine and bromine prior to cyaniding, no result; (7) preliminary roast before cyaniding, result—not a trace of silver soluble in cyanide; (8) preliminary chloridizing roast, result—fair silver extraction (75%); (9) concentration of the ore ground to 200 mesh, result—tailing assayed rather higher than concentrate; (10) oil-concentration, no result; (11) acid flotation, no result; (12) preliminary treatment with hydro-sulphides, results confirmed the tests made by myself, as described above; (13) preliminary treatment with hydrochloric acid, result—94% extraction of the silver. From the foregoing it appeared that the silver is in very intimate association with some other mineral, probably with the manganese, possibly occurring as a definite manganese-silver compound.

As to how the silver may be made amenable to cyanide solution, however, I have concluded that chloridizing is not the only, and probably not even the best, method. I am led to think that instead of trying to attack the silver, which is comparatively small in quantity, the aim should be to attack the predominant partner in the combination, that is, the manganese. In the above detailed tests, a chloridizing roast yielded only 75% of the silver on subsequent cyanidation, while the preliminary treatment with hydrochloric acid allowed of an extraction of 94%. Of course, in this latter instance, Mr. Linton may reply that the result was due to nascent chlorine formed by the manganese dioxide; it might, however, be equally well due merely to the dissolving action on the manganese, exposing the contained silver to the action of the subsequent solvent, and this view would seem to be strengthened by the fact of the chloridizing roast giving results so much inferior to those of hydrochloric acid. But if this latter view be correct, how are we to account for the re-

sults due to a preliminary reduction with hydro-sulphide? The only suggestion I have to offer is that the manganese being converted into sulphide became sufficiently soluble in the cyanide solution to expose most of the silver to the action of the solvent, forming thiocyanate and manganocyanide of potassium.

Working on the hypothesis of the necessity of finding some solvent that would break up the combination and free the silver, I tried a preliminary treatment with many reagents. (1) Nitric acid had been found useless in the early stages of the investigation, probably because it did not attack the manganese dioxide. (2) Hydrochloric acid, while very effectual, appeared to be prohibitive in cost. (3) Sulphuric acid was without effect. (4) The hydro-sulphide treatment, while effectual, was prohibitive on account of the loss of cyanide, though I found it possible to regenerate KCN from KCNS by electrolysis with caustic soda, and it might have been possible to recover some of the cyanide in this way. (5) Finally I tried 5% solution of sulphurous acid. After washing and cyaniding the residue I obtained an extraction of 84% of the silver with a cyanide consumption of only 4 lb. per ton of ore. This method seemed by far the most feasible of any, and if the ore had assayed a few dollars higher than it did the method would certainly have been tested on a working scale. The amount of sulphur required would in this instance have been about 100 lb. per ton of ore.

Thus it is seen from the foregoing results that there are several methods of treatment besides chloridizing which were found to give good cyaniding extractions on the silver in this manganiferous ore: (a) preliminary roasting with sulphur in absence of air; (b) preliminary treatment with alkaline sulphides; (c) preliminary treatment with hydrochloric acid (it may be open to those who think differently to put this method in the chloridizing class); (d) preliminary treatment with sulphurous acid. Of all these, the last seems the most practicable and least expensive, and with an ore assaying a little higher than that which was experimented on, would seem to offer a workable solution of the difficulty in the cyanidation of these manganese-silver ores. It may be remarked that the gold in such ores usually yields uniformly high extraction of about 90% under almost any circumstances regardless of the behavior of the silver.

Sulphides, polysulphides, and hyposulphites in the same solution may be determined as follows, according to Dhuique Mayer: dilute 10 c.c. of the solution to 100 c.c., and of this dilute 10 c.c. to 200 c.c., and titrate with N/10 H_2SO_4 with phenolphthalein indicator (A). Titrate this with N/10 I solution and starch indicator (I). Decolorize with a minute drop of the original solution, and titrate with N/10 NaOH (R). Dilute another 10 c.c. of the original, shake with 2 gm. $PbCO_3$, and titrate the filtrate with N/10 I (H).

A = Sulphides. R = total NaHS.

R - A = true NaHS. I - 2R = polysulphide and hyposulphite.

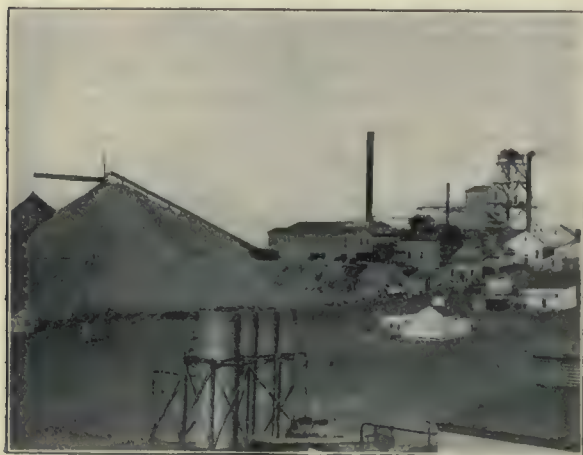
H = hyposulphite. (I - 2R) - H = polysulphide.

In the case of polysulphides divide the titer by 2 and calculate as Na_2S_2 .

GRAPHITE—AN OBSTACLE TO GOOD CYANIDING.

Written for the MINING AND SCIENTIFIC PRESS
By M. W. VON BERNEWITZ.

Graphite occurs in gold mines in different parts of the world; and in several instances it has proved to be a great nuisance in the treatment of ores by cyanide. In the treatment of the sulpho-telluride ores of Kalgoorlie, it was noticed in certain mills that the extraction occasionally fell off for no apparent reason, although all conditions were favorable for good work. Ore from certain parts of the mines was known to contain graphite, and it was when this class was being milled that the trouble occurred. In the mines on the eastern side of the 'Golden Mile', the Brownhill, Associated Northern, Oroya, and Associated, the three first named working solely on the well known Brownhill lode, and the latter partly on the south end of it, the graphite is found in the slate or schist in fair quantities. In the Brownhill it is not



Associated Northern Mine.

important in this connection. The graphite occurs generally on the hanging wall of the lode, but without doubt there are numerous seams through the lode itself. This appears from the fact that even if the hanging wall material is sorted out, a little graphite still comes to the mill. In the Associated Northern, pockets of almost pure graphite are sometimes found. The mineral also occurs on the walls of the lode in the Great Boulder mine, and in the Lancefield mine, some 200 miles north of Kalgoorlie.

When breaking down ore in the Associated Northern, the graphite can, to some degree, be picked out; but where it is finely distributed through the ore this cannot be done, and remains to complicate the subsequent treatment. In the dry-crushing mills, during the roasting of the ore no doubt some of the graphite is burnt, but the bulk remains unchanged. When the roasted ore is mixed with the circulating waters the trouble commences. The graphite forms a scum on the pulp in the grinding pans, collects on the overflow lip, and from here no doubt a great deal floats away with the slime to the settlers. Likely enough a little may go to the agitators with the thick slime, although as regards the latter point there is no proof. The circulating waters are weak KCN washes (about 0.04%) from the filter-presses, and contain from 50c.

per ton or more in gold. I think there is little doubt that a precipitation of the gold takes place while the graphite is in violent agitation with the pulp in the pans, and probably some precipitation in the settlers. As to its taking place in the agitators with 0.08% KCN, no means are available for determining. Extraction generally drops from 2 to 5% when graphite is present, varying with the grade being milled. Scum collected from the pans was filtered and washed carefully, and assayed. In the cupel a fair sized bead of gold was seen, but as the quantity assayed was small and there was nothing definite as to the amount of graphite in the ore, no calculation of its value was made. It seemed clear, however, that the graphite had precipitated this gold from the circulating solutions. The graphite schist from the mine gives only a trace by assay. It may be mentioned that there is a good deal of gold dissolved by the circulating solution in the pans and settlers, as well as in the agitators. An analysis of the graphite slate or schist is as follows:

| | Per cent. |
|--|-----------|
| Insoluble (silicious matter) | 86.80 |
| FeS, | 3.28 |
| Fe ₂ O ₃ | 4.53 |
| Al ₂ O ₃ | 1.40 |
| CaO | 1.40 |
| MgO | 0.25 |
| C (graphite) | 0.75 |
| H ₂ O, and undetermined | 1.59 |
| | 100.00 |

By increasing the final heating in the furnaces a good deal of the graphite would be destroyed, but such heat would sinter the ore, which is undesirable. A sample roasted in a muffle-furnace resulted in the graphite being burned off, but the conditions in a muffle and those of a roasting-furnace are entirely different. In roasting this sample the ore was well stirred, and when agitated with gold solution the extraction was all right. Other samples of ore, roasted, but not stirred much, and agitated with solution for 16 hours, showed poor results. It has been suggested, and tried, that the grinding should be done in fresh water, as the graphite would not have the same chance to precipitate any gold. This is all right, but it would require running to waste a good deal of spent solution every day, which would hardly pay, since the manager seldom knows when the graphite is coming into the mill. Being finely distributed in some classes of ore, its first appearance is on the pans. Solution accumulates in slime plants to an annoying degree at times, let alone taking in extra quantities. Using only barren solutions for the pans was tried for some time, but as mentioned above, a good deal of gold is dissolved in this department, and the graphite will do its work just the same.

To illustrate the different behavior of graphite and charcoal, I might mention that the ash-heap from the furnaces is being put through the mill at our plant. The ash is about equal parts of charcoal and dust, the latter from the hot-ore conveyor, hot air being taken here from the fire-box. During the roasting all the charcoal is burned out and no trouble is experienced. The waste acid from the clean-up is run through two large boxes of charcoal. When it

gets rich enough, say 20 oz. per ton, it is dried, fed into the ball-mills, and mixed with the ore. It is completely burned in the roasters and causes no after effects.

The Oroya-Brownhill, working the same lode as the Associated Northern, treats its ore by wet crushing with stamps, concentration, pans, and tube-mills, agitation with BrCN, and filter-pressing. Ore containing graphite is occasionally sent to the mill, and soon thereafter the extraction and even precipitation falls off. The graphite forms a scum on the settlers, the circulating waters being a weak KCN solution. At the Associated the ore is treated by the ordinary dry-crushing and roasting process, and although a little graphite finds its way into the mill, little trouble has been experienced from this source. The graphite shown me on the Great Boulder mine is a pure graphitic schist, and is found on the walls of the lode in places. The ore is treated by ball-milling, and Griffin mills and roasting, and the graphite gives trouble by precipitating the gold. At the Lancefield there is both graphite and arsenic in the ore, and the treatment of these has not yet been determined.

A custom mill here, the Kalgoorlie Gold Recovery Co., buys sulphide ores, concentrate, slags, etc., treating these products by ball-milling, roasting, grinding, and filter-pressing, as the case may be. Now and again old crucibles and the like are mixed with the charges, and the graphite from these floats on the top of the thick slime in the cone agitators, agitation being effected by air at 10-lb. pressure. So far, the manager has not been able to see that bad results are caused by the graphite; but a strange thing was noticed, that, in filling 5 cones with the same class of slime, the graphite would only form a scum on one. We have noticed the same occurrence with the pulp in our pans.

The matter rests at that, and until some method is devised to deal with the graphite, the trouble can only be minimized by carefully excluding such ore from being sent to the mills.

Portland cement analysis, according to Dementieff, may be accurately made as follows: the cement must be pulverized exceedingly fine, and then on digestion with diluted HCl, SiO_2 and all can be brought into solution. If the HCl is of known strength some constituents can be determined by titrating back with normal NaOH. Without adding an indicator run in normal NaOH until the solution clouds. This indicates the amount of excess of HCl used. Add phenolphthalien and then run in N/NaOH to coloration; this gives $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ (filter off and determine Fe_2O_3 in the precipitate by the usual method—reduction and permanganate titration). On heating the clear solution the phenolphthalien coloration slowly disappears; continue adding the NaOH until the color is permanent while hot; the amount of NaOH so used, when doubled, corresponds to the MgO present. The reaction is explained by the author as due to the gradual formation of $3\text{MgO} \cdot \text{SiO}_2$ which separates on heating. Under these conditions where there is not sufficient SiO_2 to combine with both CaO and MgO, the latter combines preferably with the SiO_2 .

COSTS AT THE BRADEN COPPER MINE.

By WILLIAM R. BRADEN.

*The following is an extract from the operating report of the Braden Copper Co. for November 1908. Costs are given in United States currency, and weights in dry tons of 2000 lb. The total cost of breaking 16,185 tons, including superintendence and general charges, was 41c. per ton. Upon the basis of 7304 tons extracted and milled, the costs per ton were distributed as follows:

| | |
|-------------------------------------|--------|
| Ore breaking | \$0.31 |
| General mine expense..... | 0.06 |
| Development | 0.12 |
| Underground tramming | 0.02 |
| Aerial tramming | 0.06 |
| Milling: Operation | 0.27 |
| Repairs (labor) | 0.01 |
| Repairs (materials) | 0.09 |
| General mill expense..... | 0.05 |
| Power | 0.01 |
| Sampling and assaying..... | 0.05 |
| General expense | 0.23 |
| Taxes, insurance, and interest..... | 0.04 |
| | <hr/> |
| | \$1.32 |

The ore-breaking account includes much cutting out for ore pockets, sub-cross-cuts, raises, and other work of a preparatory nature. More than one half of the labor was performed by contract. In the stopes, contracts were let on the basis of the number of feet of hole drilled. The actual cost of the labor for one month was: 164 man-days (9 hr.), with $2\frac{3}{4}$ -in. New Ingersoll air-drills, drilled 5082 ft. at a cost of 2.025c. per foot. Average amount drilled per man-day, 31 ft.; 1008 man-days, by single hand work, drilled 13,855 ft. at a cost of 8.2c. per foot. Average amount drilled per man per day, 13.8 ft. Including all labor, both contractors and day pay men employed for mining, there were 12 tons of ore broken per man-day. Since the above date, a system of contracting for ore-breaking by measurement of the ore broken has resulted in a considerable reduction of the cost for that item in the foregoing statement.

Development included drifts, cross-cuts, and raises, with an average section of 4.53 sq. m., and, including all labor, supplies, explosives, mucking, and tramming, the cost was \$3.54 per foot driven, or 78c. per cu. m. The amount of driving was 379 linear feet, with 876.75 man-days, making 13 linear feet per month per man, or 0.433 ft. per day, and 1.96 cubic metres.

A concrete idea of what is considered to be good work is illustrated by the case of a contract let for driving a main adit, of a section of 6 sq. m., at a total cost of \$3.15 per running foot, exclusive of drill sharpening and repairs; 132.25 ft. were driven in 30 days. Payment of all labor accounts is made three times in each year, on January 1, May 1, and September 1. The workmen are permitted, however, to draw up to 80% of their balances at any given time; a custom of the country which leads to constancy of work and gives entire satisfaction. Wherever possible, a bonus is paid to encourage good steady work.

*Abstract from paper read before Amer. Inst. Min. Eng., Spokane meeting.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

All-Sliming.

The Editor:

Sir—I have read with very great interest E. M. Hamilton's article on 'All-Sliming', which appeared in your issue of August 21. In it Mr. Hamilton describes a method devised by him for the separation and collection of fine sand for cyanide leaching. A practically identical method of classification has been in use at this mine for the past twelve months. It was thought out by George L. Carlisle, a local mine operator, and has given entire satisfaction, producing the cleanest product it has been my fortune to handle; this with a mill product averaging over 60% slime.

After passing through a cone classifier, which removes the lighter slime, the battery product is fed to a distributor possessing arms of such length that the pulp is directed against the sides of the vat. All the arms are of equal length and have nozzles bent at an angle of 45°, exactly as described by Mr. Hamilton. The pulp running down the sides of the vat builds itself gradually upward with a smooth level floor sloping gently toward the central discharge. This discharge consists of a vertical wooden tube of square cross-section, 3 in. diam. On two sides are bored 2-in. plug-holes at 4-in. centres. These are staggered in such a manner that there is a hole for every 2 inches in height of the collecting tank. The slime running down the sloping surface

of the collected sand, is discharged through the holes. As the tank fills, the sand gradually approaches the centre, and when within 18 in. or thereabout of the plug-hole, the latter is closed with a wooden plug, and the slime-discharge takes place through the aperture next above.

It will be seen that this method only differs from that of Mr. Hamilton in the form of the central discharge. His method, that of a tube built up in sectional rings as the tank fills, has the merit of obviating descent into the tank. At this mine a ladder is left in the collecting vat as it fills, standing on the rungs of which the workman puts in the plugs as occasion requires. The method of filling with a Butters distributor, meanwhile drawing off the slime through plug-holes, is not new, having been used in at least one Californian plant. There, I believe, the holes were in the periphery of the vat. The use, however, of a distributor having arms of equal length so arranged as to allow the pulp to impinge on the wall of the vat, coupled with a 'built-up' central discharge, seems to me to be original with Mr. Hamilton and Mr. Carlisle, and a happy instance of two minds in different parts of the world hitting upon the same ingenious and simple idea.

HUXLEY ST. J. BROOKS.

La Libertad, Nicaragua, October 13.

Time-Sheet Voucher.

The Editor:

Sir—Below is a time-sheet voucher form which we have found valuable in our work and which may be of service to others as a base for their own.

We have these punched, and when a man comes to work for us we enter on one of these sheets his name, amount of wages, and where he is working. It is

[Specimen Copy.]

TIME SHEET VOUCHER.

THE ARIZONA HERCULES COPPER COMPANY.

Name, Martin Navarro.

Time sheet for month of October 1909.

Where working, intake for pipe-line.

Wages per day, \$2.

| | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 1 | 1½ | 1 | 1 | 1 | .. | .. | .. | 1½ | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| .. | .. | 1 | 1 | 1½ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Total, 25½ days at \$2..... amount \$51.00

DEDUCTIONS.

| | | |
|------------|---|--------|
| October 3 | Order on Henness, Giffin & Leonard..... | \$2.00 |
| October 17 | Order on Henness, Giffin & Leonard..... | 5.00 |
| October 11 | Order on Henness, Giffin & Leonard..... | 10.00 |
| October 13 | Order on Henness, Giffin & Leonard..... | 3.00 |
| October 17 | Order on Kelvin Produce Co..... | 7.00 |
| October 26 | Order on Henness, Giffin & Leonard..... | 6.00 |
| | Hospital fee, single man..... | 1.35 |

Total \$34.35 \$34.35

Balance, sixteen and 60/100..... \$16.65

Approved, W. P. DUNHAM, President.
E. G. THOMAS, Secretary.

Received in full payment of the above account from the
his
Arizona Hercules Copper Co., MARTIN X NAVARRO.
mark

Ray, Arizona, November 10, 1909.

The above has been examined and found correct, E. G. THOMAS, Superintendent.

then hung up on a clip having a pasteboard flap marked 'Time Sheet Vouchers'. When our men come for orders on the stores, or when a debit, or any account is charged against one, the entry is made in the appropriate place. At the end of the month, or when the man leaves the service of the company, the time-sheet, signed by him, forms a voucher. It is printed on paper $7\frac{1}{4}$ by 9 in., which can be folded conveniently for filing. On the back is an ordinary voucher record form.

W. P. DUNHAM.

Ray, Arizona, November 15.

Modern Quicksilver Reduction.

The Editor:

Sir—I note with interest the criticism by H. W. Turner of Mr. Strauss' article on the reduction of quicksilver ores. The point, that mercurial soot does not accumulate in the furnace, is well taken, but I think Mr. Turner's further statement that, "in American furnaces 70% of the mercury runs out of the condensers as pure metal," is true only exceptionally. The grade of the ore governs the yield more than almost anything else. This is due to the fact that the fuel gases, passing through the condensers, are practically constant; while the mercurial, sulphurous, and other gases emanating from the ore vary with the grade of the ore. Consequently, the proportion of the soot condensed from the fuel gas does not increase with increase in mercury, and as the mercury portion of the soot increases sufficiently it drops on the inclined condenser floor and accumulates into puddles which have sufficient gravity to force their way through the soot down to the channel. The amount of free metal is also governed by the character of the ore. In Texas, where the mineral occurs in limestone, there is practically no difficulty in condensing, and the percentage of free metal is high; but in Arizona and Mexico, where the mineral occurs in schist and is free from all lime or iron, proper condensing is more difficult, and there is practically no free metal. In Texas, with 0.5% ore, the free metal was 15%, while with 1% ore, the free metal amounted to 46% and the free metal increases as the grade of ore increases. As to the loss in reducing quicksilver ores, I do not know of a plant in America which is properly equipped to determine the absolute loss in roasting quicksilver and condensing the fumes therefrom. I have read many guesses as to what this loss amounts to, varying from 4 to 25%, but no one has offered evidence to substantiate any of these assumptions. As for myself, when a plant has been in operation some time, and the condenser bricks thoroughly saturated, I would guess about 5%. Of one point I am satisfied—the loss does not occur through inefficiency in the roasting plant. A well built furnace of the Scott type, properly conducted, will volatilize practically all the metal in an ore, provided the ore does not exceed 2.5%, but the brick condensers connected with this same plant are about as poor condensers as it is possible to have, and they are accountable for most of the loss in the reduction of quicksilver ore.

CLIFFORD G. DENNIS.

On the train, November 20.

American Merchant Marine.

The Editor:

Sir—In the days preceding the Civil War the United States is said to have been the leading maritime nation of the world. It is also said that the shipping interest was built up by discriminating in tariff duties between American and foreign ships, by giving those sailing under the American flag lower duties than were given to foreign ships. If that policy made this the leading maritime nation, why should it not do so again?

W. C. WYNKOOP.

San Francisco, November 20.

[One of the early acts of the Federal Congress after the adoption of the Constitution was to encourage American shipping by granting a rebate of 10% upon customs duties on goods imported in American bottoms. The stimulus of this law called into being a merchant marine which excited the hostility of Great Britain. The fixed policy of that country since the days of Drake has been to prevent the growth of any rival merchant marine. This led to the development of a great navy, and to activity in naval warfare which has made Great Britain the dominant sea-power of the world. Only recently has a rival been suffered to develop serious strength upon the seas, and that has been the cause of some embarrassing interpellation of Mr. Asquith on the floor of the House of Commons by gentlemen in opposition. The development of American shipping during the early days of the Republic has been ascribed by some to the superior timber available for that purpose along the New England coast, to the greater cheapness of naval construction in America at that time, and to a reputed superiority of American seamen. It was evident that British statesmen entertained no fantastic notions in regard to these supposed advantages. The development of the American merchant marine, unattended by an equivalent fighting navy for its protection, led to the war of 1812, resulting in what might be termed a drawn game, from which Albert Gallatin's astuteness as a diplomat, aided by Henry Clay's dogged persistence won for the United States more treaty benefits than the relative military and naval positions of the parties at the end of the struggle would have strictly warranted. But the treaty of Ghent left open other questions, to be settled by a commercial treaty later on, and it was in the subsequent adjustment of these commercial matters that America lost her position as an important maritime nation. In compliance with the commercial convention and agreements between the two countries, the law providing for discriminating duties was erased from the statutes by Act of Congress in 1828. The decline of the American merchant marine from that time forward would plot a rapidly descending curve, which argues ill for the theory of natural advantages which this country was supposed to enjoy. At the present time the advantages in cost of construction favor the foreigner because of our tariff. To re-establish an act for discriminating duties, some exceedingly delicate work would be required of Mr. Knox to negotiate treaties releasing us from the engagements made at a period of national weakness.—EDITOR.]

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Mining claims in Honduras are taxed ₡10 per pertenencia of one hectare, when the denouncement has been for gold and silver, and ₡5 for coal, salt, and other substances. The taxes are due and payable in January of each year. Failure to make prompt payment causes the loss of the property.

Carbon, while an almost perfectly resistant converter lining in steel making, is rapidly destroyed on account of the affinity for it of that metal. It has often been tried in the form of brick, as well as rammed with tar, and although the matter is again under review its practical use seems out of the question.

Electrolysis of very active metals like manganese and silicon, when using alternating current, results in the solution of these metals, that is, one half wave dissolves, but the other does not re-deposit. Especially inert metals like platinum are deposited by alternating currents, the negative half wave depositing, but the positive half wave does not dissolve.

Phonolite is the volcanic equivalent of nepheline-syenite, and consequently is rich in soda. It may be described as nepheline-trachyte. The phonolites are porphyritic rocks with a completely crystalline matrix consisting of sanidine and nepheline in which occur isolated crystals of orthoclase, nepheline, and pyroxene. Phonolites are readily decomposed.

Desecho is used in many senses in connection with mining in Mexico. In the patio process it is applied to the floured mercury. It also means the waste material rejected in the sorting of ores; and the waste rock produced in mining is similarly called. It is also a name given to the gob-walls, in the building of which the Mexicans are particularly expert. The refuse or skimmings from lead refining are also called *desechos*.

Vanning is a name given originally to the testing of an ore by concentration on the point of a shovel, after the manner of washing in a horn-spoon. It gives a particularly clean concentrate in the hands of a skilled operator, and makes a high saving of the heavy minerals contained. Vanners attempt to imitate the same motion, but it is extremely difficult to accomplish it mechanically. Recent forms of vanners have an oscillating motion instead of a simple side-shake, but this still misses the ideal vanning movement.

Machinery and other improvements which are affixed to the land are real property and become the property of one who makes a valid re-location of the ground on which they are situated. A sale of such improvements by the former owner prior to forfeiture would not affect the rule as to fixtures, unless they are removed before adverse rights attach. In cases of mistake and fraud, however, courts have sometimes interposed and exercised their equitable powers and allowed the original owner to re-

move fixtures. The fact that the re-locator is a stockholder in a company which formerly owned the ground would not of itself affect his right to make a re-location of the ground, provided there is no bad faith involved, and provided he does not hold a fiduciary position in the company.

Regenerators were formerly placed under the open-hearth furnaces which they served. Old furnace men still claim that with such construction a furnace works somewhat quicker than does the present type. The objections are: (1) When the furnace rests on the arches of the chambers there is always some distortion due to changes in temperature and it is difficult to keep the structure gas and air tight. (2) Any breakout allows the metal from the hearth to run directly into the checkers, filling them and making an enormous amount of work before the furnace can be again put in commission. (3) Repairs are more difficult to make.

Alaskite is a term proposed by J. E. Spurr to designate the group of holocrystalline quartz and alkali-feldspar rocks to which the name aplite had previously been rather loosely applied. Aplite had come into wide use as a textural term applied to rocks of many kinds usually occurring as dikes. Rocks of granitic texture and habit, consisting essentially of quartz with orthoclase or other alkali-feldspar are wide spread in Nevada and the term alaskite has found ready acceptance in discussions of the geology of that State as well as in Alaska where it was first applied. With addition of black mica, alaskite grades into biotite-granite.

Matte is an artificial sulphide formed in smelting as a result of the union of sulphur with bases. Iron sulphide such as is used in making hydrogen sulphide in the laboratory is the simplest form. To produce it in small quantities an assay crucible may be filled with nails and brought to a white heat, sulphur being added until the content fuses. In smelting a charge containing sulphur, scrap iron will take up the sulphur and form matte. If copper oxide or copper sulphide is present the sulphur unites with the copper in preference to the iron. When the copper is exhausted, the excess of sulphur expends any remaining combining power in taking up iron.

Vanning shovels as made in Cornwall consist of thin sheet-iron plates weighing 2 to 3 lb. The plate is 14 to 15 in. long by 13 in. wide, and is dished nearly an inch in the centre. It has a socket or eye to receive a handle and the back of the shovel on either side of the eye is slightly turned up. The handle, which is about 3 ft. long, is usually of ash or hickory, and has a bend a little way from the socket. The face of the shovel should be smooth and kept bright. In the hands of a skilled vanner the separation of mineral from gangue is easy. The sample to be vanned is crushed ordinarily to 30 mesh. If the mineral is finely disseminated it may be necessary to crush to 60 mesh. The vanning shovel is used principally in determining the percentage of tin oxide present in ores. With care and practice fairly accurate concentrations may be made.

Special Correspondence.

KALGOORLIE, WESTERN AUSTRALIA.

September Output.—Gas Plants.—Taxes.—Transcontinental Railroad.

The September output from the State was valued at \$3,075,000, \$2,340,000 of this going to the local mint, and the balance of \$735,000 being exported. The Kalgoorlie district turned out \$1,680,000 of the total. Following are the returns from the large producers:

| Name. | Tonnage. | Value. | Profit. | Dividend. |
|--------------------------------|----------|-----------|-----------|-----------|
| Associated | 11,234 | \$103,000 | \$ 30,000 | ..... |
| Associated Northern Blks. | 3,533 | 28,000 | 9,500 | ..... |
| Chaffers | 3,745 | 35,000 | 10,000 | ..... |
| Golden Ridge | 2,340 | 29,000 | 14,000 | ..... |
| Golden Horseshoe | 24,681 | 245,000 | 100,000 | ..... |
| Grt. Boulder Proprietary.. | 18,117 | 250,000 | 135,000 | ..... |
| Grt. Boulder Perserverence.. | 18,845 | 135,000 | 25,000 | ..... |
| Great Pingall..... | 10,474 | 73,000 | 9,500 | ..... |
| Hainault | 5,689 | 38,500 | 7,500 | ..... |
| Ivanhoe | 19,231 | 203,000 | 100,000 | ..... |
| Kalgurli | 10,450 | 135,020 | 75,000 | ..... |
| Lake View Consols..... | 11,140 | 75,000 | 12,500 | ..... |
| Lancefield | 7,949 | 64,000 | 3,000* | ..... |
| Oroya-Brownhill | 11,137 | 102,000 | 38,000 | ..... |
| Oroya-Black Range | 4,595 | 56,000 | 22,000 | ..... |
| Sons of Gwalla..... | 13,009 | 110,000 | 44,000 | \$60,000 |
| Sons of Gwalla, South.... | 2,065 | 20,000 | 3,000 | ..... |
| South Kalgurli | 9,036 | 62,000 | 14,000 | ..... |

*Loss.

The diamond-drill at 2600 ft., in the Great Boulder, cut the lode on the Horseshoe boundary, there being 4 ft. worth \$7.25 per ton in the latter property. At about 600 to 800 ft. from the surface the two mines had the lode on the boundary, where it was very rich indeed. No doubt the Horseshoe will now sink to 2600 ft. from its present depth of 2000 ft. September was a very windy month here, and the dust from the dumps was really unbearable for work. The dumps being so high, the wind simply makes sport of them, and the dust flies for miles. Two mines have abandoned the stacking of residue by belt; one is now sluicing it away, and the other has reverted to trucking. This is just as cheap, and stops the dust nuisance. It was thought a fine plan a few years ago to use belt-conveyors for the disposal of residue, but ideas have changed of late. The Hannans Star and Boulder Deep Levels, on the south end of the belt, have amalgamated, amid much protest from local shareholders. The mines come in on equal terms which has been the subject of unfavorable comment. Despite this, the English shareholders have carried the business through. The Hannans Star has a plant of two Krupp ball-mills, a large tube-mill, settlers, agitators, and filter-press plant using the BrCN process. The plant did much custom work some years ago. In connection with the tube-mill, it may be mentioned that it was the first used in the world in the fine grinding of gold-bearing ores. I think this is a recognized fact, despite other claimants.

The erection of small suction gas plants continues, much rivalry between the different makers resulting. One make is rather well known on account of its crank shafts breaking. Up to 50 hp. gas plants do well. One of 37 hp. driving three Huntington mills which crush 100 tons of oxidized ore per day, and also furnishing power for several pumps, costs \$5 per day on charcoal, against \$30 using firewood for steaming. The erection of these plants means a difference to electric power plants, including the power company. With reference to the latter plant, it might be stated that, there are three vertical engines of 800 hp. each; and two horizontal engines, one of 800 hp., and the other of 1500 hp. driving generators direct. The vertical engines have the Corliss valve gear, but were never entirely satisfactory as regards steam consumption, so it was decided to remodel the engines with Sulzer valve gear. English and European engineers' suggestions were not satisfactory, so it was left to the firm of Kelly & Lewis, in Melbourne, to do the work. One engine has been altered, and is running satisfactorily

with more than 10% economy over previous operation. It may be explained that this was no easy problem to solve.

There have been good rains at Tawarin, the new gold field near the border of Western Australia, and the northern territory. At Southern Cross, some 100 miles west from here, is the Transvaal mine, with a good surface showing of ore worth \$15 per ton. The ore, however, is refractory as it contains about 15% arsenic. After much experimenting it has been decided to erect Krupp ball-mills, Edwards roasters, and the usual treatment plant. It will be interesting if this process is satisfactory, as the treatment of arsenical pyrite is no easy matter. In this connection, word comes from New South Wales that an oxy-hydro process has been successfully used on an arsenical ore over there. Details are not yet to hand. There has been more trouble with the firewood employees, but it is all but settled now. The government is to further tax dividend-paying mines. At the time of paying dividends, it is usual to pay the 5% duty. Now, however, the government requires payment on both the dividend and duty paid, being in fact, a tax on a tax. A test case is to be fought in the courts. The report of the engineers for the Transcontinental Railroad is now before the Federal House. It is most interesting, and contains data as to gauge, grades, water supply, pastoral country, desert, geology, and mileage. The cost is estimated at some \$20,000,000.

JOHANNESBURG, TRANSVAAL.

Bold Prospecting — Average Working Costs. — Driving on Lines.— Robinson Enlarged Mill.—Randfontein Progress.— Big Ore Reserves.—Acute Labor Shortages.

The boring operations of the New Rand, Ltd., undertaken to prospect for the Main Reef series below the Karroo beds (700 ft. thick), near the southern rim of the Wit-



Hand-Drill Work on the Rand.

watersrand basin, do not excite much local interest. The concern is financed in England. Full reports on the year's operations have appeared, written by A. R. Sawyer, the consulting engineer and leading spirit in the enterprise. For plucky and pertinacious effort, this probing in the dark by the New Rand is almost unequalled. Funds seem to come in satisfactorily, though the concern is not rich. Over 16,000 ft. of diamond-drilling has already been done, and, of course, it is always the next thousand that will reveal the 'New Rand'—a title which must inevitably prejudice Transvaal engineers against the company. Supposing cer-

tain beds can be roughly correlated with known markers on the Rand, there is no reason to assume that the Main Reef horizon can be accurately determined, or, if a strong 'banket' series is cut at a likely horizon, that there will be payable gold. There are ample exposures of Witwatersrand formation, with numerous 'banket' beds at Venterskroon to the west of the New Rand's area, and in many places stretches of payable ore occur. But no geological authority has presumed to mark the Main Reef horizon. If, then, we are in the dark as to precise correlations in a great outcropping succession of beds of Rand formation, how is it that such confidence can be expressed in determining horizons and the identity of indicators by means of bore-hole cores? If Mr. Sawyer cuts a payable reef, it will provide some hope of subsequently successful mining; but let the 'Main Reef' and 'New Rand' word-juggling be dropped.

Rand working costs appear to have reached a temporary halting place, in their downward course, at about 17s per ton. The shortage of native labor, resulting in reduced tonnages and an increase of machine stoping, has no doubt been one of the causes militating against the continuance of the gradual reduction. Although the average costs of \$4.08 per ton milled have been published far and wide, an analysis of the items has not lately appeared. Averaging the figures for a large number of representative mines, the following segregation may be obtained and presented as typical of the Rand today:

| | Per ton mined. | Per ton milled. |
|---------------------------------|-------------------|--------------------|
| Mining. | | |
| Stoping | \$1.04 | \$1.20 |
| Shoveling and tramming..... | 0.42 | 0.48 |
| Pumping, hoisting, etc..... | 0.48 | 0.56 |
| | \$1.94 | \$2.24 |
| Sorting | | 0.06 |
| Crushing | | 0.05 |
| Transportation | | 0.06 |
| Stamp-milling | | 0.37 |
| Tube-milling | | 0.14 |
| Cyaniding, sand | | 0.28 |
| Cyaniding, slime | | 0.12 |
| General and head office..... | | 0.32 |
| Total, except development | | \$3.64 |
| Development | | 0.42 |
| Grand total | | \$4.06 |

The percentage of sorting averages 15.5, and the yield per ton milled, \$6.70, giving a net profit, after allowance of 8 to 10% for profits tax or about \$2.40 per ton.

In a recent letter it was mentioned that the Rand Collieries, Ltd. (a gold mine in faulted portion of the East Rand), proposed to run their levels straight, instead of following the 'reef'. In the last quarterly report it is stated: "The levels are now being driven on line under the reef, with the exception of the connecting drive to No. 2 shafts, and therefore no reliable data can be given of current development." Is this good policy? The Rand Collieries and the adjacent Van Dyk have not made as good a showing in development results as at one time anticipated. Few properties on the Rand have more urgent need to 'hug' the reef, and thus gain as much knowledge of grade and faultings as possible. The time is not yet ripe to think of economical haulages and so forth. The Robinson, which has stood at the head of the list of single-mill producers for nearly two years, is about to drop an additional 40 stamps. At present it is running 210 heads and four tube-mills, the tonnage being about 47,000 per month, and a yield of £110,000. When dropping 250 stamps, the yield will not increase proportionately, for the new plant was primarily erected to deal with Main Reef, which only averages 20s. per ton, as compared with the present average

for ore from all sources of 45s. Running at full pressure, the enlarged mill and cyanide works of the Robinson will be producing gold at the rate of £1,400,000 per annum, from a block of ground 190 acres in extent which has been mined steadily since 1888. The Randfontein group, controlled (in every sense of the word) by Sir J. B. Robinson, is so frequently the basis for idle rumors and so much secrecy is allowed to enshroud its operations, that we must be grateful to the *South African Mining Journal* for publishing photographs of the construction work in hand on the Central mine. It is now certain that the erection of the great 600-head mill under one roof, is going ahead rapidly. The concrete foundations, in two rows each 607 ft. long, 12 ft. high, and 10 ft. wide at the base, are completed. The Nourse Mines, Ltd., (a subsidiary of the Rand Mines, Ltd.), appears, from its recently issued annual report, to be in a remarkably strong ore reserve position, as, indeed, are the majority of the Eckstein mines. This company has lately been milling at the rate of 500,000 tons per annum, but increase of plant will soon raise it to 700,000 tons. The ore reserves are calculated at 2,100,910 tons of payable ore (7.1 dwt.), and 750,000 tons of unpayable (3.2 dwt.), equivalent to a good three-years supply. The labor shortage, influencing nearly all the mines of the Rand adversely, is most acutely felt by certain recently equipped mines which are unable to expand from the developing to the producing stage. Thus, the Vogelstruis Consolidated Deep is unable to operate its new mill, and the Geduld, which has already done some experimental milling, is unable to resume. A number of mines are running on short time or with stamps hung up. Those companies whose nominal labor complements are fixed on a hand-labor basis, and which can probably employ machines economically for a portion of their tonnage, are best able to face present difficulties.

BRITISH COLUMBIA.

Greenwood Smelter. — Granby Mines at Phoenix. — Copper Costs.

The British Columbia Copper Co., at Greenwood, is mining and smelting 1800 tons of ore per day, having three copper furnaces in operation. This company's fiscal year ends November 30, and the official report of the year's operations, by J. E. McAllister, general manager, will soon be published. It is generally reported in this district that the B. C. Copper company has acquired control of the stock of the New Dominion Copper Co., and that the mines of the latter will be operated in close association with those of the former company. The New Dominion mines include the



Map of Part of British Columbia.

Brooklyn, Standard, Stemwinder, Idaho, and Rawhide, in the neighborhood of the Granby; the Mountain Rose, at Sunset camp, the Athalston at Wellington, and the Sunset and C. O. D. at Deadwood, near Greenwood. Some prospecting by diamond-drills is in progress on its properties

at Phoenix, and it is believed a considerable force will be put at work within a few weeks.

The Granby Mining, Smelting & Power Co. is mining about 4200 tons of ore per day at its Phoenix mines, with a force of 550 men and 70 air-drills. At the Granby mines proper, there are three shipping units, comprising adits No. 2 and No. 3, and the Victoria shaft. No. 2 adit, which goes in 1800 ft., has steam locomotive haulage, but equipment for electric haulage has been ordered and will soon be installed; No. 3 adit, which has been driven in the same distance as No. 2, is already equipped for electric haulage, all the ore broken between No. 2 and No. 3 being handled from this level. In moving the ore from these levels to the railroad shipping bins 10-ton cars are used. In the vicinity of these two adits is No. 2 shaft, 400 ft. deep, used exclusively as a manway and for carrying steel to and from the workings. The Victoria shaft extends 500 ft. at a 60° incline, having three compartments, two for 7-ton skips, and one for a manway. The hoisting is performed by a double-reel 250-hp. Westinghouse electric hoist. At each of the shipping units named is a crusher that reduces to a fairly uniform size the ore before it is shipped to the smelting plant at Grand Forks. This company is also shipping ore from the Gold Drop mine, through its Curlew tunnel. The system of mine trackage of 30-lb. steel rails aggregates six miles in length. The cost of mining, transporting, and smelting Granby ores is said to approximate \$2.50 per ton. The cost of producing copper and putting it on board cars at Grand Forks is 7.12c. per lb.; with the expenses of transportation, refining, and marketing the product in New York added, the cost amounts to 8.8c. per lb. The recovery of copper from the ore approximates 20.3 lb. per ton, and the gold and silver extracted amounts to about \$1 per ton. The smelting plant treated 107,000 tons for October, and for November it handled about 130,000 tons. Assuming that the Granby company can mine and smelt an average of 4500 tons of ore per day during the next 12 months, its production for that period will aggregate 40,000,000 lb. of copper. This company has \$1,100,000 invested in the Crow's Nest Coal Co., which owns 40,000 acres of coal land in eastern British Columbia.

JOPLIN, MISSOURI.

New Mills and Mines at Duenweg, Sarcxie, and Elsewhere. — New Form of Lease. — Lawrence County Mines. — Oklahoma Deposits.

The zinc mines are beginning to feel the effects of returning prosperity. New mills are being built, old ones overhauled, and preparations are everywhere being made for active work. At Duenweg a new mill owned by the Wolfsheart company is almost completed. As soon as the pumps can drain the ground the plant will be started. The mill has a capacity of 300 tons. Development on this lease has been carried forward steadily during the panic season, and the ground is now well opened. It shows a sheet deposit similar to those on the majority of tracts in that camp. A mill is also being erected on the Deerstone land, at Neck City, by the Clifford company. It has a capacity of 150 tons. Rich deposits have been found on this land. The Smithfield mill, north of Webb City, is nearly completed. It is a plant of 250 tons re-erected. The Cameron property at Sarcxie, where a new mill was built last year, has been taken over by J. W. Boyd, the owner of the land. The lease is being put in condition for steady operation. The Cameron company has never given adequate attention to the property because of other interests in the East. This property is considered to be one of the best in that camp. The shaft will be sunk to lower levels at once. The old Kathleen property, in Lehigh valley, is being unwatered preparatory to re-starting. A new 150-ton mill is to be erected here. The ground shows free ore running 10% zinc. Two new shafts are being sunk in the Duenweg district by the Coahuilla company. One is in ore and the other almost to the ore-level. The property shows an unusually rich sheet ore deposit and no timbering is required. During its short operation the Coahuilla has been a heavy producer of zinc blende.

An interesting side light on how the future is coming

to be taken into account is shown by the plotting of a 20-acre tract in the Prosperity camp by D. Haughton with sub-leases subject to the provision that mining is to be confined to levels above 130 ft. This allows mining only in the soft ore deposits, leaving the sheet levels to future development. The property has been mined at shallow levels and much good galena removed. The old time free ore continues to be found on the Davey land, northeast of Joplin. Such ore has been recently developed on the Helen-Ruth lease, and on the May-Allen ground. Six holes have been put down on the Helen-Ruth, five of which cut ore. On the May-Allen eight holes have been sunk, four of which struck free ore, while the other four entered sheet zinc. The free ore extends from 130 to 150 ft. in depth. Much gouging for shallow lead has been done on this ground in the past, and one of the old shafts has been re-cribbed and sub-leased.

At Aurora and outlying camps in Lawrence county work is also active. Preparations are being made by Jim Housewright to re-open the old Daisy Bell mine at Aurora. A



Building a New Mill at Joplin.

recent accident here cost several lives. There is still much rich ore in sight and the mine will be entered through the shaft of the White Rose. The Industrial Mining Co. has just been organized in Aurora for the development of a tract of 200 by 930 ft. including the site of the old foundry. It is a part of the old Elliot property famous for galena. The company has let a contract for the sinking of eight shafts. On an adjoining tract a company took out \$40,000 worth of galena ore on a 100-ft. lot, the largest output ever made from a shallow mine in Aurora.

In Oklahoma, as well as Missouri, zinc mining is active. A discovery recently made by the Okmulgee Mining Co., at Miami, has made the property a producer. With a small two-jig mill the company is turning out a ton of zinc concentrate per hour, and a ton of galena per shift. The equipment is inadequate and fully 50% of the ore goes into the waste. Arrangements have been made for the erection of a large 200-ton plant on the Amalgamated Lead & Zinc Co.'s lease on a 10-acre lease of the Miami Royalty Co.'s land. Four shafts have been put down, three of them penetrating the rich run of ore opened on the Turkey Flat and King Jack adjoining. The ground is said to run about 25% ore, with the proportion of zinc blende to galena as 2 to 1. The ore extends in the shaft from 100 to 120 ft. Two rougher jigs are to be installed, the tailing from the first being sent over the second to insure a greater saving. The development in the Peoria camp has begun to attract con-

siderable attention, and a steady turn-in is now made weekly. E. E. Gordon, who is operating on the Keller lease, is just sinking a second shaft in order to save the long haul required underground since the extension of the drifts. The silicate is quite general, the grade being high, running 48%. On another lease operated by Mr. Gordon, a shaft is also being opened and the whole property revived after a long idleness due to litigation. The ore is mainly silicate though a small amount of blende is also produced.

LONDON.

Mount Lyell Report. — Definition of Mineral — Litigation.

An abstract of the report of the Mount Lyell Mining & Railway Co., for the half-year ended September 30, has been issued by cable. The total amount of ore smelted during the six months was 190,482 tons, averaging 2.81% copper, 1.98 oz. silver, and 0.6 dwt. gold per ton; of this 124,843 tons came from the Mount Lyell mine and 65,639 tons from the North Mount Lyell; in addition 499 tons of metal-bearing fluxes and 156 tons of purchased ore were treated. The yield was 4538 tons of blister copper containing 4484 tons of copper, 362,001 oz. silver, and 6489 oz. gold. In addition to the ore smelted, 6922 tons were used in the manufacture of acid. At the beginning of the six months 1088 tons of copper remained unsold. This has since been sold at an average price of £58 11s. 8d. Of the copper produced during the six months 3189 tons have been sold at an average price of £60 4s. 4d., leaving 1295 tons unsold in September. The net profit for the half-year was £139,850 after allowing £5299 for taxes, £9930 for depreciation, and £18,461 for exploration, and the dividend distributed absorbed £105,000. The amount of ore treated during the half-year was rather less than usual, a decrease accounted for by the interference of the weather with work in the open-cut. Extensive prospecting work has been conducted in the North Mount Lyell, and the most important development has been the discovery of bornite in payable quantities at the 1100-ft. level. The extent of the formation has not yet been fully ascertained, but the indications are encouraging. In the higher levels, notably those at the 700-ft., 850-ft., and 1000-ft., the orebodies have been found to be of greater extent than originally estimated, and the reserves have been correspondingly increased. The ore reserves on September 30 are reported as follows: Mount Lyell, available by open-cut 493,232 tons averaging 0.6% copper, 1.97 oz. silver, and 0.5 dwt. gold; at the North Mount Lyell, 777,594 tons averaging 6% copper, 1.33 oz. silver, and 0.1 dwt. gold. The reserves at North are 63,658 tons greater than six months ago, and are, in fact, larger than at any previous period in the history of the mine. The cost of producing blister copper was 15s. 5½d. per ton of ore as compared with 15s. 7½d. per ton during the previous half-year. With regard to prospecting work at other mines, it is reported that the properties on the Norfolk range, though proved to contain copper, are too far from communication to warrant development at present. Prospecting is also being conducted in the Mount Balfour district. The fertilizer works belonging to the company, at Yarraville and Port Adelaide, are in full operation, and the demand for the fertilizers is so strong in various parts of Australia that a new plant is being erected at Fremantle, Western Australia. This branch of the company's business has been a great success, and in order to cope with the extra work involved it will be necessary to appoint a special committee of the board.

Disputes continue in England relating to the definition of the word 'mineral'. The owners of mineral rights are always litigating with owners of surface rights and claiming the mineral values of deposits on the surface. Most of the cases are between railways and mine or quarry owners, but we also find the owners of clay beds making claims, and often these are allowed. The question arose recently in Parliament when the new taxes on minerals were proposed. In all cases it has been supposed that a mineral according to the Acts was any constituent of the earth's crust which gave an additional value to the surface, agricultural, or building value of the land. There has been a variety of judgments in the courts, not all in harmony, but on the

whole favoring the mineral rights. A decision of the House of Lords this week, however, has practically knocked over the whole of the arguments and given the benefit of the doubt to the landowner. The case was a dispute between the North British Railway and the Budhill Colliery Co. as to the right of the latter to quarry sandstone underneath the railway. The first two courts in Scotland gave the colliery judgment, but the House of Lords has unanimously reversed the decision and gone in favor of the railway. They went back to first principles and ruled that the Acts could never have meant to deprive a railway of the bed-rock on which it was built, although the stone might be of value for building purposes, and consequently be worth quarrying. This decision is quite subversive of many preconceived and old-fashioned notions, and will considerably alter the views of the subject in the future.

The litigation between the Ore Concentration Company and Minerals Separation, in which it was alleged by the former that its Elmore patents of 1898 and 1901 were infringed by the process used by the latter and patented by Sulman, Picard, and Ballot in 1905, has at last been concluded. In the first court the decision went in favor of the Minerals Separation and in the court of appeal the decision was reversed. The case was subsequently re-argued before the House of Lords and their decision was given on November 16. They reverse the decision of the court of appeal and pronounce for the Minerals Separation. Thus it is held that the Sulman-Picard-Ballot process as applied at the works of the Sulphide Corporation at Broken Hill is not an infringement of the old Elmore oil process. The action had nothing to do with the modern Elmore vacuum process which is successfully working at the Zinc Corporation's works at Broken Hill and elsewhere. The Elmore patent of 1898 described the flotation of sulphides by large quantities of heavy oil and that of 1901 stated that the addition of small quantities of acid increased the affinity of oil for sulphides. In the Sulman-Picard-Ballot process, very small quantities of oil are used, together with some acid, and reliance is placed on the buoyancy of air or gas bubbles for the flotation. The Elmore patents were held by the House of Lords to refer to the use of large quantities of oil and, therefore, not to be an anticipation of the patents of 1905. It is impossible here to go into full details. There is a common supposition that the Elmores were the first to discover the affinity of oil and acid for sulphides, which is quite a mistake, as may be seen from a perusal of an article on the 'History of the Flotation Processes' that appeared in the September issue of *The Mining Magazine*. On the other hand, it must be said that the Elmores were the first to evolve a working process, and they deserve the credit for being the practical pioneers of this method of concentration.

GOLDFIELD, NEVADA.

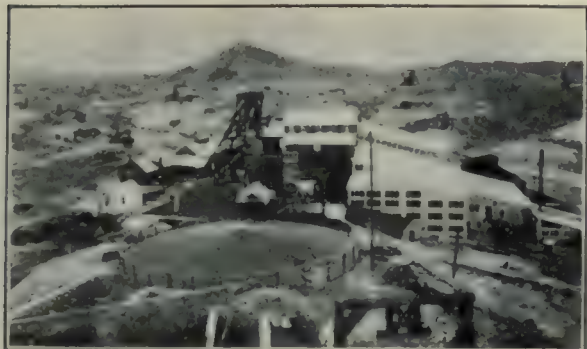
Injunction Against Assayers.—Mohawk Development.—Florence Mill.

The taking of testimony in the hearing of the application of the Consolidated, Florence, and Fraction companies resulted in an injunction against a number of local assayers, restraining them from purchasing ore, concentrate, precipitate, bullion, or other gold-ore products without first notifying the complainant companies and permitting an inspection by their agents, action was delayed by the large volume of work required for the Wells Fargo Express Co.'s agent to prepare a statement of shipments made by that company. The cashier of a local bank produced records showing that bullion shipments had been made through his bank between June 1 and October 2 amounting to \$31,000, and of this amount it is charged that \$26,200 was the product of ore stolen from the complaining companies and reduced to bullion by local assayers who bought the stolen ore from miners. The granting of an injunction of this sort, while unusual, seems to have been amply justified by the facts submitted. Concentrate in particular could hardly in this camp come honestly into the hands of individual miners.

Large bodies of excellent milling ore are being developed at the southern end of the Combination No. 1. and on the Combination No. 2. On the fourth and fifth levels stopes are in places over 20 ft. wide. The ore has been followed

to a point near the boundary line of the Florence, near the workings of the rich Reilly lease. From an adit driven into the Jumbo hill to tap the old workings of the Zinn and other early leases, some high-grade ore is being taken by a small force of miners. Much of the territory formerly under lease on the Mohawk and Jumbo is yielding high-grade ore and a large tonnage of material that had caved in the old stopes has been found to yield good returns from treatment. The workings about the caved Hampton stope are being cleared. Drifts are being driven in good ore toward the old leases at the north of the Mohawk No. 2 claim.

The Florence mine is now making a better production than ever before, and, according to the management, the mill, with its new 200-ton gyratory crusher, may be relied upon for a daily treatment of 160 tons. It is stated by the



Florence Mine and Mill.

president of the company that there is now sufficient ore of good quality blocked and ready to hoist in the workings immediately adjoining the mill to supply the plant for a year without further development. New ground is also constantly being opened with excellent results. At the 350-ft. level a lateral is being driven to a point under the workings of the old Reilly lease. In driving north to this ground the work is almost continuously in paying ore. In October the Florence mill treated 4056 tons of ore with an estimated recovery of \$110,000.

BUTTE, MONTANA.

November Output. — Amalgamated-Clark Litigation. — North Butte-Tuolumne Trouble.

Production of copper by the Butte companies in November aggregated 27,889,140 lb., produced from 409,380 tons of ore, the various concerns contributing to the total as follows:

| Companies. | Ore, Tons. | Copper, Pounds. |
|--------------------------|---------------|--------------------|
| Boston & Montana | 103,800 | 7,785,000 |
| Anaconda | 105,150 | 6,519,300 |
| Butte & Boston | 19,200 | 1,171,200 |
| Washoe | 16,350 | 981,000 |
| Parrot | 11,280 | 654,240 |
| Trenton | 12,000 | 720,000 |
| North Butte | 41,400 | 3,146,400 |
| Butte Coalition | 60,000 | 3,960,000 |
| Original | 23,100 | 1,617,000 |
| Pittsburg & Montana..... | 6,600 | 627,000 |
| Davis Daly | 4,500 | 288,000 |
| Miscellaneous | 6,000 | 420,000 |
| | 409,380 | 27,889,140 |

Pittsburg & Montana production is owned by the East Butte Copper Mining Co., and represents the yield of first-class ore only, little second-class being mined at present. The Coalition production includes that company's share in the output of a number of orebodies mined by associated companies.

Matters are shaping for an important contest in mining litigation between the Amalgamated Copper interests and the W. A. Clark companies. A year ago the Amalgamated served notice on Mr. Clark that he has been mining on ore-

bodies claimed by the Amalgamated, but he treated the notice with slight respect; in fact, he told the messenger to take his notice to a place reputed to have more heat and sulphur than the smelters of Butte. Papers have been prepared, but have not been filed in court, the delay, it being presumed, being due to the copper merger negotiations in New York. Mining lawyers who are not interested in the controversy appear to be of the opinion that the defense of Mr. Clark has little merit. Under the old mining laws, governing the location of the Original and Stewart mines of the Clark company, the limits within which mining could be done were narrow, and it is claimed that long ago Clark passed beyond these and into ground owned by the Amalgamated company, and that, therefore, the Original and Stewart claims practically have been worked out. The shafts of both mines have been sunk deeper and the veins intersected still farther beyond the legal boundaries of the properties, according to the Amalgamated contention. If the Amalgamated should be successful in the courts heavy damages for ore already mined will undoubtedly be assessed. The Amalgamated was involved once before in litigation with Clark over a property owned by him and known as the Colusa-Parrot. The evidence presented at the trial was so clear that in settlement of the judgment Clark turned his mine over to the Amalgamated. To avoid suits over the Stewart and Original questions the Amalgamated frequently offered to buy the properties from Clark, and several times he fixed a price on them. Each time he changed his mind before the deal could be closed. Once he started for New York to close the sale, but between Butte and New York he raised his price \$10,000,000 and the Amalgamated people declined to be 'held up' as they called it. It has been said that Clark has held out on the copper merger because of the pending trouble with the Amalgamated, seeking to force a settlement as the price of his consent to enter the combine.

The outbreak of litigation between the North Butte and the Tuolumne company appears to be rapidly approaching. Both are working on the same vein and orebody, the one claimed by the North Butte as the vein of the Jessie mine. The 1600-ft. level of the Jessie, on account of the higher elevation of the property, is little higher than the 1400-ft. level of the Tuolumne, where the latter company has been developing a large vein north of the Tuolumne shaft. In raising from the end of the 1400 cross-cut the Tuolumne broke into the 1600 workings of the North Butte on the Jessie vein. The latter working is a drift run east from the Speculator cross-cut in the Jessie ground, and is all the way in the Jessie vein, which fact would seem to indicate that the North Butte is working on its own vein and orebody, and that the Tuolumne is on the same vein.

MEXICO.

Railway Extensions.—Power Lines.—Oil War.—Oaxaca Mining.

The National Railways of Mexico have issued for some time past, an advertising magazine under the title of *Mexico Today*. This is to be changed to *The Mexican National Magazine*, and it will be improved and made into a magazine of value, dealing with all matters of interest, historical, scenic, agricultural, mining, and commercial, to be found in the territory covered by the National lines. The contract has been let for the grading of 72 kilometres of the new Vera Cruz al Istmo branch line which will eventually connect Rivas station with San Andrés Tuxtla. This will open up a rich and fertile region. The contractors are McGavock & Borrowe. They have also been doing a considerable amount of work on the Southern Pacific line on the division from Guadalajara northward. The international boundary bridge across the Suchiate river, between Mexico and Guatemala, on the line of the Pan-American railroad, is to be commenced at once. The Mexican Railway Co. has just bought the Córdoba & Huatusco railroad. It is only a small line about 20 kilometres long, extending from Córdoba to San Juan Coscomatepec, and connects at Córdoba with the Mexican and with the Vera Cruz & Pacific roads. It is an important feeder.

A concession has just been granted to Albert A. Tripp

for the right of building a railroad from Miraflores to Ensenada de Santiago, in the State of Colima. The line, when completed, will tap a rich mineral district and will also form a new outlet to the Pacific. The construction of the proposed railroad from Ameca to Chamela, in the State of Jalisco, will soon be commenced. The necessary capital has been obtained by floating in London a company with a capital of over £1,000,000. The line will be standard gauge and 325 kilometres long. It will open important mining districts and will give Jalisco its first seaport on the Pacific, at Chamela. Charles Wittemore has been the moving spirit in financing this enterprise.

It is stated by Emilio Pinzon, the general manager for the Chapala Hydro-Electric & Irrigation Co. that the company will not be able to deliver power in the Hostotipaquillo or Etzatlan districts before April of next year. This is due to the delay in the construction work of their power plant at Puente Grande. Lewis Bradbury, of Los Angeles, who is the principal owner of the famous old Tajo gold mines in the Rosario district of Sinaloa, is down in the Hostotipaquillo district with George A. Tweedy, looking into a number of *antiguas*, with a view to purchase. If the deals are carried through it will mean another large mining and milling enterprise in the district. The mines owned by the Bradburys in Sinaloa are producing about \$50,000 per month and are credited with a total production since the Colonial days of over ₧80,000,000.

The Mexican Pacific Co., of Seattle, Washington, is planning to build an important railroad line in the State of Guerrero which will have a length of over 100 miles, and will connect the port of Zihuatanejo in the northwest with the port of Acapulco. Construction will begin at once. There have been persistent rumors lately regarding the building of a new line from Toluca into the State of Guerrero. The route that has been surveyed will run from Toluca to Coyuca de Catalan on the Balsas river, and then up the river to Tetela del Rio. The project seems to have some relation to the DeKays-Lipton interests, but no definite information can be obtained, as to who is really back of it. The oil war and cut rates continue with all the energy possible, and in some parts of Mexico the price is as low as ₧2.65 per case. The search for new fields and the drilling of wells goes on with unabated zeal. Besides the Mexican Petroleum Co., the Pearson-Aguilar, and the Oil Fields of Mexico Co., there are eight concerns operating and prospecting in the States of Vera Cruz, Tamaulipas, and San Luis Potosi. The Mexican Fuel Co., which is one of the Pierce interests, has found excellent oil in the well recently brought in on the Panuco river, about 30 miles from Tampico. The Mexican Oil Co., an independent concern, will sell the oil from its well to the Waters Pierce Co. The Standard Petroleum Co., a leasing and exploring company, operating in the same district, is closely associated with the Mexican Oil Co. The Southern Pacific interests are sinking a second well between Tampico and Ebanio, to find sufficient oil for locomotives.

A company with a capital of \$2,500,000 is being organized by W. R. Ramsdell to operate the Refugio, Las Animas, and Tres Estrellas mines, and the Amajac reduction works, in the Hostotipaquillo district, in Jalisco. The properties of the Ayutla Mining Co., in Jalisco, which include the Zapatero, San Felipe, and Vesuvio, have been transferred finally to the Carrizo Copper Co., of St. Louis, Missouri. The price was \$60,000, of which the final payment of \$36,000 has been just made.

The Old Mexico Mining Co., operating several gold-silver properties in the Sierra Juarez of Oaxaca, is making plans to increase the size of its cyanide plant. In the same district is the Natividad mine, where the owners are erecting a large cyanide plant which is nearing completion. The plant would have been ready sooner but a quantity of piping was delayed in shipment. This necessitated buying all the local supply of piping in Oaxaca. The total cost of the plant will be about ₧300,000. The company has had to suspend payment of dividends during the erection of the plant as a result of the heavy capital-outlay. There is a large reserve of milling ore on the patio, so that soon after the plant resumes operation dividends can be paid.

CHIHUAHUA, MEXICO.

Railways and Smelters. — Development in San Ignacio Mountains.

A new standard-gauge line is to be built into the Murphy tract, in the State of Durango. This branch railroad will be about 100 kilometres long, and will be built under the supervision of the National Railroads. The capital and guarantees will be supplied from private sources, as the policy of the National is not to invest any further sums during 1910 to 1911, on branch lines or new construction. The backers of this line are Pimentel Brothers, of Mexico City, Joaquin Casasus, Ed. Hartman, of Durango, and several others. They are all heavily interested in the Murphy tract, and in the country that will be opened by the new line. The surveys have been made, and specifications are now being prepared. The daily press has also announced that a line between Gutierrez, on the line of the Mexican Central in Zacatecas, and the city of Durango would be built. As a matter of fact it has been officially stated by representatives of the Towne interests that there is no prospect of the line being built in the near future. The Mexico Northwestern Railroad Co. has let to R. Y. Dudley a contract for grading 40 miles of the line to be built northward from the lumber camp of Madera to Terrazas, in the State of Chihuahua. The Canadian syndicate which owns the concession to build the great dam on the Conchos river has recently bought a large tract of land that will be flooded. The price paid was ₧140,000.

In the Tepehuanes district of Durango, some rich finds have recently been made on the El Conde mine, on the 400-ft. level. The vein varies from one to three feet in width, and the rich ore struck runs from ₧50 to ₧100 per ton, about 25% of the value being in silver and the rest in gold. I. J. Fitzgerald, of Omaha, has just been elected president and general manager of the El Conde company. A concession has just been granted to Luis Terrazas, J. W. Clayton, and Charles Seawell, to build a smelter in the municipality of Temosachic, in the district of Guerrero. The concession runs for ten years with the usual exemption from State taxation. The concessionaires are planning to build a smelter of 100 tons capacity to be placed in the copper-gold-silver district known as Guaynopita, about 40 miles west of Madera. The new railroad will pass within 25 miles of the proposed plant. Quite a number of the Mormon colonists in Chihuahua, own mining claims in this district. It is stated that large mineral tracts have been taken up and are being held, awaiting the building of the railroad. Active work is now going on in the Hauriche canyon near Torreon in view of the probable construction of a railroad line into this district by the Turquoise Copper Co. The smelter of this company will also be enlarged. R. D. Anthony has been appointed superintendent. In the same district are situated the Esperanza, Casino, Rayos del Sol, and Porfirio Diaz properties. J. F. Johnston, acting on behalf of the American Smelters Securities Company, holds a lease on the Jiboa mine at Jimenez, near Parral, and is starting development to prove the property. Some work is also being done on the Los Trenes and Solisas prospects, two shafts will be sunk and the hoisting machinery, which has already been bought, is on its way from Santa Barbara to the mines.

Preparations are under way for more extensive developments on the San Juan and Bonita mines, which are situated in the San Ignacio mountains, about 12 miles south of the Rio Grande. These mines form part of a group consisting of 59 pertenencias, equal to about 147 acres of ground. They are owned by J. E. Townsend, and associates, of El Paso. The vein varies from five to twelve feet in width, and has a calcareous slate roof-wall, and a porphyry hanging wall. The ore is silicious copper, carrying 6 to 12% copper and 4 to 8 oz. of silver per ton. About 1200 ft. of development has been done on the properties. The ore will be shipped to smelters in the States by way of El Paso. The work on the big Palmilla mill for Parral is rushed. The spur track is nearly completed, and work will be started on the concrete foundations for the mill in a few days' time. The structural steel for the buildings is also expected shortly.

General Mining News.

ARIZONA.

COCHISE COUNTY.

Eight cars of 50% copper matte were shipped from the smelter of the Arizona United Mining Co., in the Johnson district, to the Douglas plant to be refined and the company will continue shipping two cars per week.—The new Oliver power plant of the Calumet & Arizona Mining Co. was started recently developing 2000 hp. The current will supply power for the Warren-Bisbee electric road and light for the town of Warren as well as for the Calumet & Arizona properties.—The White Tail Copper Mining Co. has been organized to take over the Doran & Gallagher claims in the Paradise district.—Sinking was resumed at the 135-ft. level of the shaft on the Morrow & Chamberlain group. The bottom of the shaft is now in ore and it is the intention of the owners to ship that taken out in the development to the Copper Queen smelter as was done from the 40-ft. level some time ago.

GILA COUNTY.

The new pumping plant recently installed at the Eureka shaft of the Arizona Commercial Copper Co., near Globe, has lowered the water to the 700-ft. level and work has been started at that point.—The south cross-cut from the Sullivan shaft at the Cordova property, in the Miami district, is in 156 ft. the face being in chalcocite ore of commercial grade. The new shaft is down 30 ft. in the oxidized zone.—One ton of ore from the old Centennial mine sent to the Old Dominion smelter assayed 450 oz. silver per ton with a considerable copper content.

MOHAVE COUNTY.

One of the most important mining transactions ever made in this county was effected a few days ago when all the property of the Arizona-Mexican Mining & Smelting Co., operating the Needles smelter, was transferred to A. P. Anderson of the U. S. Smelting, Mining & Refining Co. The property conveyed includes the smelter and real estate in Needles; the Iron Bar group of mining claims near Siam, and a lime quarry at Vanderbilt, both in San Bernardino county, California; and the following mines in the Wallapai district of Mohave county: Infallible, Star Spangled Banner, Alta, Twins, Blue Lode, Twin Gulch, Champion, Champion No. 2, Twin Gulch No. 2, Arizona No. 1, and the north half of the Winchester. This makes 30 mines and prospects now owned in this county by the U. S. Smelting, Mining & Refining Co.—In the Chloride district, A. L. White and associates of Lima, who recently acquired possession of the Midnight mine, have bonded the adjoining Pinkham mine, and are now examining the contiguous property owned by George Beebe and D. F. Meredith.—At the Bl Metal mine, where Spurr & Cox, Inc., are conducting mill tests for John Hays Hammond, there is reported a find of rich ore assaying as high as \$600 per ton.

PIMA COUNTY.

Several large shipments of supplies are being hauled from Tucson to the Gold Bullion mines in the Baboquivari mountains. The company has been re-opening the mine for the past five months, and has found ore in the shaft and drifts on the 175-ft. level.—The Wayne Development Co. is hauling high-grade ore from its Rochester property in the Cababi mountains to its mill at Weldon. The company is planning to handle custom ores at the plant and will purchase the output tributary to the Weldon mill.

YAVAPAI COUNTY.

(Special Correspondence).—The Arizona Power Co. has its towers up and lines strung into Prescott. A sub-station is being built and electricity will be delivered to the Prescott Electric Co. within 30 days. The Prescott Electric Co. will use at present 600 hp. The Arizona Power Co. is also furnishing about 300 hp. to the Walker district, and 1800 hp. to Jerome from its new generating plant on Fossil creek. The company is equipped to furnish more power and will do so as soon as pending contracts are signed.

Prescott, November 26.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—The shaft at the Argonaut has reached the 3500-ft. level and the management states that indications are good for the payment of steady dividends for a year. The directors recently declared the regular dividend of 15c. and an extra one of 5c.—The Kennedy is sinking the shaft from the 3500-ft. level. In the mill 100 stamps are dropping. About 300 men are employed.—The Bunker Hill is prospecting the 19-ft. vein opened at the 1750-ft. point, 10 ft. of which are reported to assay over \$10 per ton. The company is disbursing regular dividends of 6c. per share per month.—The new mill at the South Eureka is rapidly nearing completion and it is expected that the full milling capacity of 60 stamps will be dropping shortly.

Jackson, November 29.

BUTTE COUNTY.

(Special Correspondence).—The Cape Horn will resume operations within a few days.—New machinery has been installed at the Cohn and work on a large scale is to start.—At the Blue Hawk 25 men are working.—The Blue Lead has resumed operations with a small force. The adit is in 1500 ft. and will be driven 500 ft. farther. Large quantities of cement gravel have been opened.—The city of Oroville has asked for an order restraining the Ophir Gold Dredging Co. from operating on a strip of land within the city limits.—The London Dredger Co., which recently acquired the holdings of Oroville Dredging, Ltd., is reported to be arranging for more extensive work on its property.—The Mammoth Channel Co. is to commence steady production. The new shaft is in an excellent grade of gravel.—The Magalia Ridge Consolidated Mining Co. is working from the main adit.

Oroville, November 29.

CALAVERAS COUNTY.

(Special Correspondence).—The Cross shaft of the Utica is being equipped with new guides and placed in first-class shape. Within a few days it is expected that the mine will resume with a full force.—The directors of the Lightner have decided to sink a new shaft, as the old one is unsafe and costly. It is planned to resume operations immediately.—The Mountain King group, adjoining the Royal Consolidated, has been acquired by T. G. Lockhart, owner of the Florence mine at Goldfield.—The Calaveras Copper Co. is to commence active production at its Union mines. The smelter and concentrator have been repaired and it is expected to produce at the rate of 1,500,000 lb. of copper per month before the end of the year.—The Remer has cut the pay-gravel in the old channel.

San Andreas, November 29.

INYO COUNTY.

Seven carloads of machinery for the 300-ton mill to be erected by the Buckeye Mining Co. at its mine south of Big Pine has been shipped from the East. The company is also to erect a 500-hp. hydro-electric plant on Birch creek and a cyanide annex at the mill. A. A. Casler is superintendent.—A contract has been let to sink the shaft at the Black Canyon claim to the 60-ft. level.

NEVADA COUNTY.

The Sharp claims on Canada hill have been bonded and work will be started in a short time. Drifts will be driven on the Enterprise, Flat, and Greenman veins from which some high-grade ore has been taken in the past.—J. O. Jones, of Nevada City, has secured a bond on the Blue Lead gravel mine at Relief hill, and will commence work in the main bedrock adit in a short time. There are 670 acres along the old Union channel on the property which has been a large producer in the past.—The first 400 ft. of the new shaft at the Mountaineer mine, in the Nevada City district, has been completed, the raise having reached the surface last week. The last 135 ft. of the work was driven in nine days. Work will be started on the 700-ft. level to connect with the 400.

PLUMAS COUNTY.

P. A. Brangler, of Agnew, has obtained a bond on the

Antlered Crest group and the Blue Gravel Consolidated group on Mooreville ridge, four miles west of La Port. The claims cover about six miles of the channel, the opening of which will be in charge of W. T. Frazer.—There are 25 men repairing the ditches and workings at the Plumas-Eureka mine at Johnsville and active mining will be resumed at an early date.—Twenty-five men are working at the Bellevue gravel mine between St. Louis and La Port.

SHASTA COUNTY.

A small amount of oil has been found in the well being drilled by the Bella Vista Oil Co., at Bella Vista, at a depth of 420 ft. The oil was found in a blue shale and drilling will be continued till the sandstone under this is cut.—The Sibyl mine, at French gulch, has been turned over to Fred Bowler and work resumed at the property.—The Bullychoop mine has been closed for the winter.

SIERRA COUNTY.

The channel at the Monte Cristo gravel mine, six miles from Downieville, has been re-opened and gravel assaying between \$5 and \$10 per car found. Fred Phelps is in charge of the work for the company, which owns 1500 ft. along the channel.—The Resasco property, three miles west of Downieville, which is under bond to Lutz & Garbarino, has been shut down for the winter. It is the intention of the operators to install a compressor and drill in the spring.—A drift has been started in the South Fork adit at Forest to open the Maple Grove claims.—The old Centerville mine at Minnesota Flat is being re-opened by Harry Gray and J. M. Fly.

TRINITY COUNTY.

The Globe mine, near Dedrick, has been closed for the winter. The season has been a successful one though somewhat short owing to a break in the ditch.—The Yellow Rose of Texas mine on the border of Trinity and Siskiyou counties has been sold, and it is the intention of the new owners to continue operations throughout the winter.

TUOLUMNE COUNTY.

The adit at the property of the North Fork Consolidated Mines Co. cut the vein when in a little over 100 ft.—A new electric air-compressor is being installed at the Duffield property in the Sonora district and in the future the hoist and pump will be operated by air. The adit cut the vein when in 300 ft. and a shaft will be started on the ore near this point.—The Ralph mine has again been unwatered for examination and it is reported that it will be taken under bond by the examining parties.—Work has been started by William Blackmer who secured the contract to sink a 350-ft. shaft on the west vein at the Jumper mine.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—It is stated that the resumption of work at the Kelly adit will take place shortly after December 1.—The adit at the Rothschilds property at Argentine now in 5000 ft., is to be driven for 3000 more to cut under the rich ore-shoots that were found in the upper workings. Thomas Webb is manager.—The furnaces for the chemical laboratory at the Malm chemical-electro mill, arrived this week and are now being placed in position.—The water has receded over 100 ft. in the last three weeks from the Seven-Thirty shaft workings.

Georgetown, November 27.

(Special Correspondence).—The Ontario-Humming Bird Mining & Milling Co., through its manager, R. Staley, has entered into a contract with Henry Drukker, of Amsterdam, Holland, whereby an option is given upon 206,000 shares of treasury stock at 75c. per share. The first payment is to be made January 15, 1910, while the balance is to be paid in five installments, the final amount to be turned over August 1, 1910.—Work has been resumed at the Hoosac adit on lower Fall river.—The adit of the Syndicate Mining & Milling Co. has been extended for 700 ft., a streak of ore showing in the breast that is 2 or 3 ft. wide, the average value of the product being \$16 per ton in gold. Frank Duffy, of Dumont, is manager.

Idaho Springs, November 26.

GILPIN COUNTY.

(Special Correspondence).—The Topeka mine, in Russell gulch, has been transferred by H. P. Lowe to the Topeka Consolidated Mining Co. Plans are being prepared for the construction of a 100-ton milling plant which will be situated on the mill-site adjoining the Frontenac mill at Black Hawk.—Two carloads of smelting ore sent from the Iron mine assayed 3 oz. gold per ton.—The Ophir-Burroughs mine, on Quartz hill, has been taken under lease by a pool of local business men. A. Waters is manager.—The Rockford mine, in the Russell district, is again being developed, a contract having been awarded to Penaza & Co. to sink the shaft another 100 ft.—Work is to be resumed upon the Homestake property in Lake Gulch district.

Central City, November 26.

LAKE COUNTY.

The spur to the A. Y. and Minnie dumps has been completed and 50 tons per day of zinc ore is being shipped.—The adit of the S. H. Leasing Co., on Sugar Loaf mountain, is in 600 ft., and is opening some good ore.—Work has been resumed in the Baby shaft on Iron hill by the lessees.

OURAY COUNTY.

A dam is being built in Canon creek for the new power plant to be erected at the Thistledown mine just south of



Counties of Colorado.

Ouray.—Recent storms have greatly interfered with the construction of the Mono-Baltic smelter so the plant will not be ready for operations as soon as expected.—A rich shoot of ore one foot wide has been opened in the Wedge property through the Khedive workings and shipping has been started.—Riggs & Cotton have opened a rich body of chalcopryite and gray copper ore on their claims north of Ironton.

SAN MIGUEL COUNTY.

The Gold Pioneer Mining Co., operating leases on the Union, Smuggler, Sheridan, and Mendota dumps, at Telluride, has installed a second washing machine and is separating the ore for 35c. per ton. Henry M. Adkinson is manager.—Regular shipments of concentrate are being sent out from the Alta mill, in Turkey creek basin, with occasional lots of high-grade ore.—A recent washout at the Butterfly mill in the Ophir district took out the spur track to the mill. A light track will be laid to the main line and the concentrate let down in a mine car.

SUMMIT COUNTY.

The dredge in French gulch will be shut down for the winter in a short time. The last clean-up resulted in \$10,500 worth of bullion.—The Sallie Barber mine in the Breckenridge district has been sold for \$65,000. This is considered one of the best zinc mines in the district, and is shipping a car of ore per day from the development work. W. H. Brehmer will remain as superintendent.—The St.

John mine, at Montezuma, has been bonded to Boston capitalists for \$200,000 and a new plant will be erected at the mine.

TELLER COUNTY.

H. P. Relton has secured an 18 months' lease on the Peggy mine on Gold hill on a royalty basis.—The machinery at the Jennie Sample Gold Mining & Milling Co.'s property on Raven hill is being repaired and machine-drills will be installed in the mine by N. H. Merrill, who has a lease on the property.—The Clements Leasing Co. is shipping a car of ore per day from the Gold Sovereign mine that assays from \$15 to \$20 per ton.—The Acacia Gold Mining Co. has declared a dividend of 1c. per share, payable December 20.—The middle block of the Gold Hill claim of the Savage Gold & Copper Mining Co. has been leased to the Success Leasing Co., and the main shaft will be unwatered and re-timbered.—James A. McIlwee, of Cripple Creek, and former superintendent at the Roosevelt Drainage Tunnel, has secured a contract to drive a 12,000-ft. tunnel through Green mountain to bring water from the Laramie river to the Cache la Poudre basin.—The Carol Leasing Co. has been organized to operate a lease on the Monument mine on Battle mountain.—George Dinkins sub-leasing on the lowest level of the El Paso Gold King ground opened a shoot of ore that assays over \$40 per ton.—L. A. Van Tilborg and associates have secured a two years' lease on the Kitty Lane group on Gibbons hill. The lessees have opened a shoot of \$25 ore under a prospecting permit.

IDAHO.

IDAHO COUNTY.

The Buster mine and mill at Elk City has been shut down on account of the heavy cost of shipping the concentrate and disagreement of the officials of the company as to further development. The mill has been running steadily for the past two years on ore from the mine that assayed in the neighborhood of \$50 per ton.—The Majestic Mining Co. is installing a 10-stamp mill and cyanide plant at its property near Dixie. The Majestic company has secured ample water for the mill and has completed a wagon-road to the mill-site.—The dredges in the Elk City district have been closed for the winter on account of the cold weather.

MISSOURI.

LAWRENCE COUNTY.

The Queen City Mining Co. has sold out its leases at McDowell, south of Aurora, to the Metropolitan company, of Springfield, which will resume operations. A new shaft is down 70 ft. in fine ore. This deposit resembles a 'fissure vein' rather than the usual ore run of this region. At Stotts City the mines have begun a period of great development after a long idleness. A central pump station has been established, the cost being assessed pro rata for its maintenance. The water was too strong for one company. The Purdy mines are being revived after many years of idleness. They are shallow silicate properties. A car load was sold last week.

MONTANA.

SILVER BOW COUNTY.

(Special Correspondence).—The Butte Coalition company is now producing nearly 2000 tons of ore per day from the Rarus, Tramway, and Minnie Healy mines, and with its share of ore mined from property owned jointly by the Boston & Montana, Anaconda, and Butte & Boston companies the copper production is probably at the rate of 40,000,000 lb. per year. The company is employing 1250 men at present. While mining is at a rate higher than at any time in the history of the company, development work is still going on extensively. Shaft sinking is going on at both the Rarus and Tramway, the former having reached a depth of 2200 ft., and the latter 2000. Stations are being cut at both points, and when completed sinking will be resumed. It is the intention to sink the Rarus 100 ft. deeper and the Tramway 200 ft. more. New levels will also be started as soon as the stations at the 2200 and 2000 are completed. The large air-shaft on the Rarus, which

has been connected with the workings to the 1600-ft. level, is also being enlarged to a 4-compartment shaft by raising, the waste material being used for filling old stopes. The air-shaft is equipped with a 16-ft. suction fan and provides air for all the Rarus and Minnie Healy workings.

Butte, November 29.

The directors of the North Butte Mining Co. have declared a quarterly dividend of \$1 per share, payable December 23, making a total of \$4 this year which is an advance of \$1 over 1908 and a decrease of \$2 from 1907. It is reported that the cross-cut from the Edith May mine has cut the Jessie vein opening a body of rich ore.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—The Coalition shaft on the Mint has cut promising ore, a good percentage running over \$100 per ton. The shoot is small, but is understood to be increasing in size. The shaft is inclined and is intended to be sunk 1000 ft.—The Marigold lease on Coalition is shipping high-grade and milling ore at the National mill.—The Grutt-Balloon Hill lease on the Queen group has its shaft down 335 ft., but owing to lack of adequate milling facilities development is not hurried. Several strong bodies of milling ore have been opened and compressor and drills installed.—The Victor lease is producing steadily and sending bullion to the mint. The Victor mill is in constant operation.—Sinking on the main shaft of the Kearns has been resumed.—Approximately \$9300 in bullion was sent out from this camp last week.

Rawhide, November 26.

The well which the Nevada-Bay State Oil Co. is drilling near Blair is down over 1800 ft. and has cut a bed of shale in which a small amount of sulphur and asphaltum has been found. The work was delayed for a few days on account of a break in the casing but has been resumed and will be continued till the oil stratum is cut. J. H. Miller is in charge of the work.—It is reported that the Lucky Boy property, at Luckyboy, has been sold to the United States Smelting Co. In the west heading on the 500-ft. level an assay of a sample taken across the vein was 456 oz. silver. On the Silver Moon lease the shaft is down 200 ft. and a cross-cut started for the vein upon which the Hubbard lessees are now working. The winze from the 216-ft. level on the Broken Hills lease is going down steadily and shipments made regularly.—A new hoist is being erected on the Imperial lease on the Atlanta ground at Goldfield by J. H. Houlihan, and the shaft unwatered. When this is finished drifts will be started from the 375-ft. level. On the Matilda and Century leases cross-cuts are being driven for the St. Ives vein.—Work has been stopped at the La Mance lease until a heavier hoist is installed.—Sinking has been resumed on the 675-ft. level of the Grizzly Bear lease on the Grizzly Bear claim of the Consolidated company.

HUMBOLDT COUNTY.

Operations have been resumed at the Monnette property in the Seven Troughs district. The cross-cuts on the 400-ft. level will be extended and the shaft sunk to the 500. M. M. Garoutte is manager.—A whim is to be installed on the Dayton lease on the Buckhorn claims, and the shaft sunk from the 42 to the 100-ft. level. The vein on the surface is 14 ft. wide, and assays from \$7 to \$15 per ton.—The Florence lessees on the property of the Seven Troughs Mining Co. have resumed operations and are getting a shipment ready to haul to the local mill.

LANDER COUNTY.

(Special Correspondence).—The new camp of Bannock is situated about 14 miles in a southwesterly direction from Battle mountain. The ore seems to be found in replacements of basalt and quartzite, heavily stained with iron. At some points considerable granite and limestone is found. The veins of gold-bearing quartz are found chiefly in the older basalt formation.—The Nevada-Omaha Mining & Milling Co. has granted approximately 20 leases on its holdings. The main vein is about 4 ft. wide, with about 6 in. assaying \$100 per ton. From 160 lb. of ore, bullion valued at \$2000 was produced. About 200 sacks of ore are

ready for treatment.—Leases on the Viking have opened a 2-ft. shoot of ore running over \$3 per ton. A short distance north of the camp the Buzzard, Elko-Lander, El Dorado, and other old mines are producing steadily.

Bannock, November 26.

NYE COUNTY.

(Special Correspondence).—The Tonopah Mining Co. is devoting considerable attention to the west section of its holdings. The Red Plume shaft has been placed in active operation to handle the waste, while the ore will be drawn through the Mizpah. The foot-wall drift on the south branch of the Valley View vein has exposed 5 to 6 ft. of milling ore. A new level has been started from near the 700-ft. point of the Red Plume, and cross-cuts will be driven to intersect the new orebodies opened at the 600-ft. point.—The Belmont is practically idle, pending the installation of an ore-washer and repairs to the mill. Aside from limited developments in the lower levels, no work is being done.—The Montana-Tonopah company reports the uncovering of a new vein in the hanging wall of the Triangle vein. It is about 2 ft. wide, and occurs 12 ft. south of the main orebody. The Triangle vein-system has been opened for over 1000 ft.—Lessees are opening a strong body of \$50 ore at the 50-ft. level in the Gold Hill shaft of Jim Butler. Small shipments are being maintained to Hazen.—James Clifford reports that a 5-ft. vein of \$41 ore has been opened by his company at Ellendale.—The Pioneer lease is shipping about \$1000 daily in ore. Recent developments are satisfactory.—The monthly pay-roll of Pioneer ranges from \$24,000 to \$30,000.—The Manhattan Dexter has cancelled the Plamenaz, and Shea & Putman leases. The War Eagle Co. has secured an injunction prohibiting the Dexter from operating on its ground and a triangular fight between Dexter, the War Eagle, and Dexter lessees has been started.

Tonopah, November 27.

STOREY COUNTY.

(Special Correspondence).—The unwatering of the C. & C. shaft to the 2650-ft. level has been authorized by the Comstock Pumping Association, and within a short time the work will commence under the supervision of Leon M. Hall. It is thought that the present pumping plant, with the addition of a centrifugal pump will enable the company to unwater the shaft to the point desired.—The Rosedale group, 16 miles east of this city, has been taken over by Salt Lake capitalists. A 700-ft. adit has cut a vein at a depth of 400 ft. and driving will be started to cut two ore-shoots, which outcrop on the surface. The ore is said to assay \$12 per ton.

Virginia City, November 27.

WHITE PINE COUNTY.

(Special Correspondence).—The Boston-Ely holdings of some 300 acres adjoin the Veteran group on the west. The iron croppings of the Ely district may be traced continuously from Lane City, three miles west of Ely, to about the centre of Boston-Ely ground except on the Ely Central ground near Copper Flat where the rhyolite covers them, extending about seven miles in all. The Emma shaft of Boston-Ely was sunk in limestone for 865 ft. At this point the leached jasperoid was found. This shaft is now down 1050 ft. and still in the jasperoid, and is perfectly dry. It is now felt that as soon as the water level is reached there should be an important enrichment. T. F. Cole has expressed himself as feeling that the conditions here are similar to those at the Irish Mag claim of the Calumet & Arizona property.—Three-quarters of a mile southeast of the Emma shaft is the Alpha shaft of the Giroux Consolidated Mines Co. This shaft was sunk through 1008 ft. of the leached capping before water was found. At the 1000-ft. level a cross-cut was run in a northerly direction, and about 150 ft. from the shaft the first ore, consisting of native copper, was found. The shaft was then sunk 200 ft. deeper, and a good deal of high-grade ore taken out. At the 1200-ft. level, in cross-cutting, an immense body of this same material was found, but the water having increased materially during this work it had to be temporarily abandoned and a new shaft opened. This will be through from

the 1200-ft. level to the surface before the end of January next.—The Veteran orebody of the Cumberland-Ely Copper Co. appears to be an isolated bunch of sulphide ore, assaying about $3\frac{1}{4}\%$ copper, and originally contained some 3,000,000 tons of ore. This occurs on a bench or shelf of limestone in a trough that has protected the sulphide from oxidation and leaching. In the western part of the Veteran mine the oxidized zone becomes much deeper and has not been prospected at all.

Ely, November 27.

Snow and cold weather are proving something of a handicap to the operations of the steam shovels at Copper Flat. However, there has been no falling off in the output and the management is evidently depending upon the Flat for a supply of ore for the entire winter. The Veteran mine is still idle and a good deal of work remains to be done around the Star Pointer shaft before the Ruth mine will be ready for production.—The cold weather is causing the Giroux people a good deal of trouble with their churn-drills, and it is likely that drilling operations will soon be discontinued for the winter. In addition to their churn-drill operations, the Giroux company is also prospecting with a diamond-drill in the deeper levels of the Alpha shaft.—Thomas F. Cole has purchased from C. R. Fuller the Trevarno fraction mining claim, joining the Boston Ely on the south and lying between that property and the Veteran Ely Extension, which latter property also passed into the hands of Mr. Cole not long ago.—Salt Lake papers have announced that the Cole-Ryan interests are the financial backers of Tex Rickard in the construction of the proposed Ely Interurban road which will connect the town with the smelter and mines. The building of this road would give the Giroux company an outlet from its mines to the valley, where it is thought the company's concentrating plant will be built.

NEW MEXICO.

SIERRA COUNTY.

(Special Correspondence).—The old Ivanhoe property, in the north end of the Black Range district, is again in operation. This mine has been worked intermittently for the last 25 years, usually under lease. It has produced considerable high-grade silver-copper ore, some of which assays high in gold. The El Paso Home Mining Co. is now operating the property and is getting the old workings in shape for production. Martin Fishbeck is manager.—The Elephant Gold Mining Co., owning 15 patented claims in the extreme north end of the district, will begin active operations soon. The purpose is to install heavy machinery to sink the main shaft 500 ft. D. S. Scoville, of Chicago, is president of the company.—The plant recently installed at the old United States Treasury mine, near this place, is in active operation. The shaft is being sunk and level one is being extended to connect for air with White Eagle Shaft No. 1 about 200 ft. north of United States Treasury Shaft No. 1. Sulphide ore has been found which will assay about \$20 per ton.—B. L. Morrison has taken a lease on the Keystone claim in the north end of the camp and has assembled his crusher for shipment. The remainder of his machinery is arranged for, and it is expected that he will start operations in December.

Chloride, November 26.

UTAH.

JUAB COUNTY.

Over 600 ft. of the drainage adit at the Centennial Eureka mine, in the Eureka district, have been completed and the management estimates that the work will be finished by next April. The company recently purchased ground near the portal of the adit and will erect a plant there to supply power for the mine. R. A. Brown is superintendent.—The shaft at the Montana mine is down 200 ft. It is the intention of the company to sink several hundred feet more before cross-cutting.—A new engine has been installed on the 1000-ft. level of the Eagle and Blue Bell mine and sinking resumed.—Operations have been resumed at the Southern Swansea mine.—Power and hoisting machinery is to be installed at the Bradley group in the North Tintic district. M. F. Sammon is in charge of the work.—A.

diamond-drill has been installed on the 1500-ft. level of the Raymond-Illinois mine in the Tintic district. Compressed air will be used for power. J. C. Sullivan is manager.—J. H. Webber, who has an option on the Copper Jack property, is installing a churn-drill to prospect the ground.—The shaft at the Tintic Standard, now down 700 ft., is to be sunk through the quartzite and cross-cutting resumed.—Shipping has been resumed at the Scranton mine, three carloads having been sent out last week.—The Zuma mine has been closed down temporarily.

SUMMIT COUNTY.

Hoisting has been stopped temporarily at the Silver King Consolidated property while a new head-frame and ore-bin is installed. A shipment of 60 tons of lead-silver was forwarded to the smelter.—The Uintah Treasure Hill Mining Co. has filed suit against the Silver King Coalition Co. asking for an accounting and a division of the claims which the companies own jointly.—The Daly-Judge Mining Co. is installing a large new compressor at its Park City mine.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—R. J. Howard, of Spokane, has become general manager for the New Republic company. Mr. Howard is one of the largest shareholders in the company.—The Tom Thumb mine has been drained to the 300-ft. level.—The Ben Hur Leasing Co. is extracting and shipping about 200 tons of ore per week.—The Southern Republic company has drained the Princess Maud mine and is now installing at the shaft a 32-hp. gasoline engine. As soon as it is ready to operate, the compressor will be started and work will be resumed on the 600-ft. level.—The Bodie claim, supposed to be traversed by the southerly extension of the San Poi vein, has been sold to J. R. Johnson and associates.—A streak of rich ore exposed in the upper adit of the Flag Hill mine is being stripped and will be broken down for shipment to the smelter.—Covada, a rich camp in the southeastern part of the county, has become unusually active. Operations are to be renewed in the Keystone mine and new track is being laid in the adit for that purpose. An adit of the Southern Cross mine, now in 700 ft., will be extended. At the Imperial mine the adit will be driven ahead during the winter. A 10-in. streak of rich galena ore has been intersected by the adit in the Plymouth Rock mine. A wide vein of rich antimonial ore, mainly stibnite, has been found in the Robert E. Lee mine. Work has been resumed at the Sunflower group. At the New York mine operations are to be resumed soon.

Republic, November 29.

OKANOGAN COUNTY.

(Special Correspondence).—The Arlington mine at Ruby, on Salmon river, was first opened by a 300-ft. shaft, and later by an 1100-ft. cross-cut to the vein, opening it at 450-ft. depth. About 100 ft. of driving has been done on the vein at this level, showing it to be 4 to 12 ft. wide and between granite walls. The ore consists of quartz with gray copper, silver, and chalcopryite. The ore obtained from the last 25 ft. of driving averaged 138 oz. silver and 3.4% copper. H. S. and J. E. Stoolfire, of Spokane, are managing the property. A hydro-electric plant and concentrating mill may be installed next year.

Conconully, November 26.

(Special Correspondence).—It is reported that ore assaying 60% tin has been found on Chelan Butte; that it had been mined and on the dump for two years, unknown to the owners, and the presence of tin was only recently discovered by an assayer.—A new vein has been found in the lower adit of the Bodie mine, owned by the Duluth-Toroda Mining Co., the ore averaging \$15.38 per ton. From a recent clean-up in the mill two gold bars were shipped, valued at about \$750.—A carload of concentrate was shipped from the Nighthawk mine.—James P. Blaine, the superintendent of the Apex mine, near Chesaw, has prepared a contract for the purchase of a 10-hp. air-compressor, two Sullivan drills, a 35-hp. engine, a steel cage, cable, and 800 ft. of steel rails.

Chesaw, November 27.

STEVENS COUNTY.

(Special Correspondence).—The lawsuit against the Valley Dew Mining Co., in the Superior Court of Washington, has been settled out of court. Work has been resumed in the mine, and a contract has been let to extend the adit 350 ft.—A contract has been let for driving a cross-cut through the vein in the North Star mine. There are two other cross-cuts, one 70 and the other 145 ft. long.—It is reported that ore, assaying as high as \$2000 per ton in gold, has been uncovered on the lowest level of the First Thought mine.—The Columbia River Gold Mining & Development Co. has started an adit at the base of Gold hill, to tap the Cougar and Right Side veins. Several carloads of ore have been shipped from the Right Side vein, which paid the expense of development.

Orient, November 27.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The lessees of the Velvet-Portland mine shipped a trial lot of ore to the Trail smelter during the past week and will soon be shipping regularly.—The shaft at the Le Roi No. 2 is now down nearly to the 1300-ft. level. The mill is running 24 hours per day on second-class ore.—The weekly shipments of the Consolidated Mining & Smelting Co. amounted to 4219 tons. The Consolidated smelter at Trail also received 4400 from the Snowshoe in addition to the shipments from the Nelson district.—The billion dollar copper combine has aroused no little interest in this district, especially as it is rumored that the Granby company, now counted an important factor in the American copper situation, will very likely be absorbed. If this ultimately proves to be the case there is no doubt the Morgan trust or merger intends to control the copper output of the Boundary, as New York copper men now control the destinies of the B. C. Copper and New Dominion Copper companies.

ONTARIO.

At the Temiskaming a winze is being sunk from the 340-ft. level 300 ft. from the main shaft. This is the lowest working in the South Coleman district, and is in good ore.



McKinley-Darragh Mine, Cobalt.

There are 14 drills running in the mine and the success attained by the Temiskaming company has encouraged the others to sink, the result being that most of the larger properties of the district are deepening their shafts.—The Newman claim, in the South Lorrain district, has been purchased by local capitalists and will be known as the Bellellen Silver Mines.—The Hudson Bay Mining Co. paid a dividend of \$3 per share on November 23. This is at the rate of 300%.—Charles Gifford, of Toronto, purchased the Porcupine claims in the Porcupine district from Herbert Fade for \$20,000.—Lot A.55 of the Gilles Limit was sold by the Government for \$35,000, the largest price paid for a lot during the sale. There were 55 lots sold bringing \$362,786.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

FRANK H. PROBERT is in Arizona.

C. H. WILDMAN is at Norwalk, Ohio.

NORVAL J. WELSH is in Chihuahua, Mexico.

W. C. MENDENHALL has gone to Los Angeles.

F. B. WEEKS was in San Francisco this week.

H. W. TURNER has returned from Downieville.

A. E. DRUCKER is touring Scotland and England.

A. CHESTER BEATTY was in San Francisco last week.

P. GEO. GOW has returned to California from Europe.

ROBERT ALLEN, lately in Mexico, has gone to the Rand.

E. T. MCCARTHY has returned to London from Siberia.

F. K. BORROW has returned to London from Manchuria.

HENRY HAY returned to Johannesburg early in October.

WALTER HARVEY WEED will be in New York December 20.

J. M. BOUTWELL has been at Washington, District of Columbia.

H. KILBURN SCOTT has left for Spain on professional business.

EDGAR COLLINS is enjoying a vacation at Santa Barbara, California.

F. L. LOWELL, of Alleghany, California, has been in San Francisco.

FRANK J. PARIZEK is with the Inspiration Copper Co. at Globe, Arizona.

F. EWING, recently with the Inspiration Copper Co., Globe, Arizona, is at Butte.

WALDEMAR LINDGREN is lecturing at the Massachusetts Institute of Technology.

R. S. RAINSFORD has been recuperating in Scotland and has now returned to California.

GEORGE J. YOUNG, of the Mackay School of Mines, has gone to Europe on a vacation trip.

COURTENAY DE KALB addressed the mining students at Stanford University, November 30.

A. W. TAYLOR and W. W. TAYLOR, of Seoul, Korea, have been visiting California dredging fields.

W. L. BELL, mining engineer, has opened an office in the Jamieson building, Spokane, Washington.

R. B. LAMB, of the C. L. Constant Co., is making a professional visit to the silver district of Canada.

W. A. CLARK sailed from London on the *Mauretania*, November 20, for a trip of inspection of his various holdings in the Western States.

N. E. LINSLEY, mining engineer, of Spokane, visited the Granby mines and smelters at Phoenix and Grand Forks, British Columbia, last week.

H. C. WILMOT, who has been in northern California and southern Oregon for the past month, has gone to New York and may be addressed at the Engineers' Club.

S. W. OSGOOD has become associated with F. J. Peck & Co., chemists, assayers, and metallurgists, of Cleveland, and will represent them in Chicago with offices at 164 Dearborn street.

C. E. STEVENS, formerly of the Bagdad Chase Gold Mining Co., and superintendent of the Petit mine, Atlanta, Idaho, is now superintending a new mine on Skelton creek, near Soldier, Idaho.

MASON T. ADAMS has resigned as general manager for the Britannia Mining & Smelting Co., in British Columbia, and opened an office as mining engineer in the McPhee building, Denver, Colorado.

HERBERT M. WILSON, J. C. ROBERTS, and A. C. RAMSEY, of the Geological Survey, are giving lectures to the bituminous coal miners of Tennessee on the work of the Pittsburg experiment station. A sub-rescue station has been established at Knoxville, Tennessee, in charge of Mr. Ramsey.

Metal Prices.

LOCAL METAL PRICES.

San Francisco, December 1.

| | | | |
|--------------------------|--|--------------------------|--|
| Antimony | 12-12 ³ / ₄ c | Quicksilver (flask)..... | 50 ¹ / ₂ -51 |
| Electrolytic Copper..... | 15 ¹ / ₂ -16 ¹ / ₂ c | Spelter | 7 ¹ / ₂ -8 ¹ / ₂ c |
| Pig Lead..... | 4.65-5.60c | Tin | 33-34 ¹ / ₂ c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|----------------------|------------|----------|--------------------------------|
| Nov. 18..... | 13.37 | 4.36 | 6.39 | 50 ¹ / ₂ |
| " 19..... | 13.50 | 4.36 | 6.39 | 50 ³ / ₄ |
| " 20..... | 13.57 | 4.36 | 6.39 | 50 ³ / ₄ |
| " 21..... | Sunday. | No market. | | |
| " 22..... | 13.50 | 4.39 | 6.39 | 50 ³ / ₄ |
| " 23..... | 13.44 | 4.39 | 6.39 | 50 ³ / ₄ |
| " 24..... | 13.37 | 4.39 | 6.39 | 50 ³ / ₄ |
| " 25..... | Holiday. | No market. | | |
| " 26..... | 13.25 | 4.39 | 6.39 | 50 ³ / ₄ |
| " 27..... | 13.25 | 4.39 | 6.37 | 50 ³ / ₄ |
| " 28..... | Sunday. | No market. | | |
| " 29..... | 13.12 | 4.39 | 6.35 | 51 |
| " 30..... | 13.12 | 4.39 | 6.35 | 51 ¹ / ₄ |
| Dec. 1..... | 13.12 | 4.39 | 6.35 | 51 ¹ / ₄ |

FOREIGN METAL QUOTATIONS.

London prices November 26 are given as follows: Tin, spot, £142 15s. futures £144 15s. market firm. Lead, £13 1s. 3d., unchanged. Spelter, £23.

Steel Orders.

Unfilled tonnage of the Steel Corporation, at close of the current year, will run close to 6,500,000 tons, the largest in any corresponding quarter except 1905 and 1906, according to the *Boston News Bureau*. The following shows unfilled tonnage at the close of each quarter from June 30, 1902, to December 31, 1909, unfilled tonnage on the last named date being estimated:

| Quarter ending | Unfilled tonnage | Quarter ending | Unfilled tonnage |
|-------------------|------------------|-------------------|------------------|
| Dec. 31, 1909... | *6,300,000 | Dec. 31, 1905... | 7,605,086 |
| Sept. 30, 1909... | 4,796,833 | Sept. 30, 1905... | 5,865,377 |
| June 30, 1909... | 4,057,939 | June 30, 1905... | 4,829,655 |
| March 31, 1909... | 3,542,595 | March 31, 1905... | 5,579,560 |
| Dec. 31, 1908... | 3,603,527 | Dec. 31, 1904... | 4,696,203 |
| Sept. 30, 1908... | 3,421,977 | Sept. 30, 1904... | 3,027,436 |
| June 30, 1908... | 3,313,876 | June 30, 1904... | 3,192,277 |
| March 31, 1908... | 3,765,343 | March 31, 1904... | 4,136,961 |
| Dec. 31, 1907... | 4,642,553 | Dec. 31, 1903... | 3,215,123 |
| Sept. 30, 1907... | 6,425,008 | Sept. 30, 1903... | 3,278,742 |
| June 30, 1907... | 7,603,878 | June 30, 1903... | 4,666,578 |
| March 31, 1907... | 8,043,858 | March 31, 1903... | 5,410,719 |
| Dec. 31, 1906... | 8,489,718 | Dec. 31, 1902... | 5,347,523 |
| Sept. 30, 1906... | 7,936,884 | Sept. 30, 1902... | 4,843,007 |
| June 30, 1906... | 7,809,584 | June 30, 1902... | 4,791,993 |
| March 31, 1906... | 7,018,712 | | |

*Estimated.

Dividends.

The directors of the Copper Range Consolidated Co. have declared the regular quarterly dividend of \$1 per share. Previous dividend payments have been as follows:

| Year. | Per share. |
|-------------|------------|
| 1909 | \$4 |
| 1908 | 4 |
| 1907 | 6 |
| 1906 | 6 |
| 1905 | 4 |
| Total | \$24 |

Saturday, December 4, 1909, the Bunker Hill & Sullivan M. & C. Co. will pay Dividend 147 of \$45,000. This makes the amount of dividends paid since January 1, 1909, \$615,000, and the total to date \$11,286,000.

The Round Mountain Mining Co. will pay on December 20, 1909, to the stockholders of record on December 15 a dividend of 4c. per share.

MARKET REPORTS.

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Nov. 24. | Dec. 1. |
|------------------------|----------|---------|
| | £ s. d. | £ s. d. |
| Camp Bird..... | 1 7 6 | 1 8 0 |
| El Oro..... | 1 5 6 | 1 5 9 |
| Esperanza..... | 2 16 3 | 2 15 6 |
| Dolores..... | 1 8 9 | 1 8 9 |
| Oroville Dredging..... | 0 10 0 | 0 9 9 |
| Mexico Mines..... | 6 0 0 | 6 0 0 |
| Tomboy..... | 0 18 9 | 0 18 9 |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

| Closing Prices. December 1. | Closing Prices. December 1. |
|--------------------------------|----------------------------------|
| Adventure..... 7 | Mass Copper..... 6 1/2 |
| Allouez..... 58 | Mayflower..... 50 |
| Apex..... 4 1/2 | Mexican Con..... 5 1/4 |
| Arcadian..... 5 | Michigan..... 6 1/2 |
| Arizona Commercial..... 41 1/2 | Mohawk..... 61 1/2 |
| Atlantic..... 10 1/2 | North Butte..... 63 1/2 |
| Black Mountain..... 72 | Old Dominion..... 61 |
| Boston Con..... 20 1/4 | Osceola..... 155 |
| Butte & London..... 25 | Parrot..... 29 |
| Cactus..... 48 | Quincy..... 85 |
| Calumet & Arizona..... 102 | Raven..... 75 |
| Calumet & Hecla..... 665 | San Antonio..... 9 |
| Centennial..... 38 | Santa Fe..... 2 |
| Chemung..... 15 | Shannon..... 15 1/2 |
| Con. Mercur..... 10 | Superior Copper..... 61 1/2 |
| Copper Range..... 92 1/2 | Superior & Boston..... 14 1/2 |
| Corbin..... 20 1/4 | Superior & Pittsburg..... 15 1/2 |
| Daly-West..... 8 | Tamarack..... 64 |
| East Butte..... 12 1/2 | Trinity..... 10 1/2 |
| Elm River..... 11 1/4 | U. S. Smelting..... 63 1/2 |
| Franklin..... 16 1/4 | U. S. Prefd..... 52 1/2 |
| Granby..... 100 1/4 | Utah Con..... 44 1/2 |
| Greene-Canaan, etc..... 11 1/2 | Victoria..... 3 1/2 |
| Hancock..... 21 | Winona..... 8 1/4 |
| Helvetia..... 6 1/2 | Wolverine..... 145 |
| Majestic..... 95 | Wyandot..... 2 1/2 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

| San Francisco, December 1. | San Francisco, December 1. |
|------------------------------|-------------------------------|
| Atlanta..... \$ 11 | Midway..... \$ 17 |
| Belmont..... 68 | Montana Tonopah..... 85 |
| Booth..... 10 | Nevada Hills..... 70 |
| Columbia Mtn..... 7 | Ophir (Comstock)..... 1.67 |
| Combination Fraction..... 47 | Pittsburg Silver Peak..... 61 |
| Daisy..... 8 | Rawhide Coalition..... 19 |
| Florence..... 2.72 | Rawhide Queen..... 20 |
| Goldfield Con..... 8.07 | Round Mountain..... 58 |
| Gold Keweenaw..... 5 | Sandstorm..... 4 |
| Great Bend..... 3 | Silver Pick..... 9 |
| Jim Butler..... 10 | St. Ives..... 8 |
| Jumbo Extension..... 14 | Tonopah Extension..... 49 |
| MacNamara..... 28 | Tonopah of Nevada..... 6.65 |
| Mayflower..... 8 | West End..... 23 |

(By courtesy of the San Francisco Stock & Exchange Board.)

COMSTOCKS.

| San Francisco, December 1. | San Francisco, December 1. |
|----------------------------|----------------------------|
| Alpha..... \$ 9 | Justice..... \$ 10 |
| Alta..... 10 | Kentuck..... 9 |
| Andes..... 17 | Lady Washington..... 16 |
| Belcher..... 1.00 | Mexican..... 1.35 |
| Best & Belcher..... 58 | New York Con..... 4 |
| Bullion..... 17 | Occident Aug..... 27 |
| Caledonia..... 36 | Ophir..... 1.55 |
| Challenge Con..... 25 | Potosi..... 58 |
| Chollar..... 27 | Overman..... 58 |
| Confidence..... 90 | Potosi..... 55 |
| Con. Imperial..... 4 | Savage..... 47 |
| Con Virginia..... 89 | Scorpion..... 14 |
| Crown Point..... 99 | Seg. Belcher..... 11 |
| Exchequer..... 20 | Sierra Nevada..... 52 |
| Gould & Curry..... 25 | Silver Hill..... 6 |
| Hale & Norcross..... 48 | Union..... 57 |
| Julia..... 8 | Utah..... 9 |
| | Yellow Jacket..... 1.05 |

Assessments of the Comstock mining companies on the listed stocks are now due and payable and the amounts per share, date of delinquency in the boards and offices, and day of sale are as follows:

| Companies. | Amt. | Del. in Board. | Del. in Office. | Sale Day. |
|--------------------|------|----------------|-----------------|-----------|
| Chollar..... | 10 | Nov. 4 | Nov. 8 | Dec. 1 |
| Savage..... | 10 | Nov. 5 | Nov. 10 | Dec. 1 |
| Belcher..... | 10 | Nov. 6 | Nov. 9 | Nov. 30 |
| Potosi..... | 10 | Nov. 9 | Nov. 12 | Dec. 6 |
| Alpha..... | 5 | Nov. 9 | Nov. 11 | Dec. 7 |
| Yellow Jacket..... | 10 | Nov. 16 | Nov. 18 | Dec. 22 |
| Crown Point..... | 10 | Nov. 26 | Nov. 30 | Dec. 20 |
| Mexican..... | 15 | Dec. 2 | Dec. 6 | Dec. 29 |
| Confidence..... | 20 | Dec. 11 | Dec. 15 | Jan. 5 |
| Exchequer..... | 5 | Dec. 11 | Dec. 15 | Jan. 5 |
| Con. Virginia..... | 25 | Dec. 16 | Dec. 20 | Jan. 10 |
| Silver Hill..... | 5 | Dec. 19 | Dec. 23 | Jan. 14 |
| Union Con..... | 10 | Dec. 19 | Dec. 22 | Jan. 13 |

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. December 1. | Closing prices. December 1. |
|--------------------------------|----------------------------------|
| Amalgamated Copper..... 82 1/2 | Miami Copper..... 17 3/4 |
| A. S. & R..... 109 1/2 | Mines Co. of America..... 3-16 |
| Boston Copper..... 19 1/2 | Montgomery-Shoshone..... 1 5-16 |
| B. C. Copper Co..... 6 15-16 | Nevada Con..... 28 1/2 |
| Butte Coalition..... 27 1/2 | Nevada Utah..... 1 1-16 |
| Cumberland-Ely..... 8 3-16 | Newhouse..... 3 11-16 |
| Davis-Daly..... 5 7-16 | Nipissing..... 10 5-16 |
| Dolores..... 6 15-16 | Ohio Copper..... 5 3-16 |
| El Rayo..... 2 7-16 | Ray Central..... 2 1/4 |
| Ely Central..... 1 7-16 | Ray Con..... 20 1/2 |
| First National..... 6 3-16 | Superior & Pittsburg..... 16 1/2 |
| Giroux..... 10 7-16 | Tenn. Copper..... 38 1/2 |
| Guanajuato Con..... 1 15-16 | Trinity..... 10 9-16 |
| Inspiration..... 7 5-16 | Tuolumne Copper..... 3 11-16 |
| Kerr Lake..... 8 1-16 | United Copper..... 8 11-16 |
| La Rose..... 4 1/2 | Utah Copper..... 58 1/2 |
| Mason Valley..... 17 1/2 | Yukon Gold..... 5 |

OIL SHARES.

San Francisco, December 1.

| San Francisco, December 1. | San Francisco, December 1. |
|-----------------------------|----------------------------|
| Associated Oil..... \$50.75 | Paraffine..... \$ 1.00 |
| Bay City..... 90 | Final..... 6.50 |
| Blue Moon..... 42 | Producers..... 2.00 |
| Caribou..... 15.75 | S. F. & McK..... 25.50 |
| Claremont..... 2.10 | Sauer Dough..... 3.50 |
| Four..... 80 | Section 25..... 15.00 |
| Fulton..... 90 | Senon..... 8.00 |
| Illinois Crude..... 55 | Shawmut..... 40 |
| McKittrick..... 10 | S. W. & B..... 65 |
| Monte Cristo..... 1.65 | Turner..... 65 |
| Nevada County..... 10 | W. K. Oil..... 2.05 |

(Courtesy California Stock & Oil Exchange.)

MONTHLY STATEMENT OF DIVIDENDS PAID BY ACTIVE LISTED OIL COMPANIES TO NOVEMBER 30, 1909.

| Company. | No. of Div. | Date paid | Amount per share. | Amount of dividend. | Total paid to date. |
|-------------------------|-------------|-----------|-------------------|---------------------|---------------------|
| Alma..... | 13 | Oct. '09 | \$0.03 | \$ 11,400.00 | \$ 148,200.00 |
| Amalgamated Oil..... | 27 | Nov. '09 | 1.00 | 50,000.00 | 1,350,000.00 |
| Amer. Petroleum..... | 5 | Nov. '09 | 1.00 | 110,449.00 | 561,160.50 |
| Apollo..... | 2 | Mar. '05 | .01 | 2,000.00 | 4,000.00 |
| Associated Oil Co..... | 4 | Mar. '07 | 1.50 | 446,055.00 | 1,548,368.55 |
| Bay City..... | 2 | Aug. '09 | .30 | 30,000.00 | 40,000.00 |
| Brookshire..... | 43 | Nov. '09 | .01 | 5,000.00 | 432,500.00 |
| Caribou..... | 55 | Nov. '09 | .25 | 20,175.75 | 619,828.74 |
| Chicago Crude..... | 2 | Mar. '07 | .00 1/2 | 5,000.00 | 15,000.00 |
| Claremont..... | 54 | Nov. '09 | .02 | 9,000.00 | 278,000.00 |
| Coalinga Pacific..... | 17 | Oct. '09 | .10 | 6,500.00 | 100,750.00 |
| Columbia..... | 32 | Nov. '09 | .00 1/2 | 4,996.31 | 239,822.70 |
| Del Rey..... | 3 | May '09 | .00 1/2 | 3,927.50 | 11,782.50 |
| Esperanza..... | 25 | Nov. '09 | .02 | 3,200.00 | 46,250.00 |
| Eucled..... | 33 | Nov. '09 | .01 | 3,500.00 | 110,000.00 |
| Four..... | 68 | Oct. '09 | .01 | 3,000.00 | 207,000.00 |
| Globe..... | 19 | Oct. '09 | .01 | 6,000.00 | 75,000.00 |
| Hanford..... | 30 | Jan. '06 | 2.00 | 4,000.00 | 80,000.00 |
| Home..... | A13 | Nov. '09 | .02 | 2,000.00 | 466,000.00 |
| Homestake..... | 43 | Oct. '09 | .10 | 1,000.00 | 75,250.00 |
| Illinois Crude..... | 33 | Nov. '09 | .01 | 2,000.00 | 80,000.00 |
| Imperial..... | 66 | Oct. '09 | .60 | 60,000.00 | 1,880,000.00 |
| Junction..... | 8 | June '09 | .01 | 2,500.00 | 20,000.00 |
| Kern Oil..... | 2 | Nov. '09 | .22 | 22,000.00 | 42,000.00 |
| Kern River..... | 39 | Feb. '09 | .10 | 2,000.00 | 98,000.00 |
| Linda Vista..... | 18 | Nov. '09 | .01 | 3,838.50 | 65,254.50 |
| Luelle..... | 14 | Sept. '09 | .10 | 2,670.44 | 37,386.16 |
| Mex. Petroleum..... | 1 | Nov. '09 | .01 1/4 | 84,740.32 | 3,135,653.12 |
| Mecca..... | 6 | July '09 | .03 | 12,675.00 | 71,825.00 |
| Monte Cristo..... | 58 | Oct. '09 | .03 | 15,000.00 | 340,000.00 |
| Nevada County..... | 3 | Oct. '08 | .04 | 10,000.00 | 40,000.00 |
| Palmer..... | 6 | Nov. '09 | .01 | 18,020.05 | 178,280.70 |
| Paraffine..... | 1 | Nov. '09 | .01 | 3,000.00 | 3,000.00 |
| Peerless..... | 77 | Sept. '09 | .06 | 6,000.00 | 801,000.00 |
| Piedmont..... | 6 | Aug. '09 | .01 | 3,890.00 | 22,987.30 |
| Final..... | 1 | Nov. '09 | .10 | 15,000.00 | 849,841.00 |
| Pittsburg..... | 10 | Nov. '07 | .24 1/2 | 58,800.00 | 124,800.00 |
| Record..... | 5 | Nov. '09 | .05 | 5,000.00 | 25,000.00 |
| Reed Crude..... | 10 | July '09 | .05 | 5,000.00 | 1,112,000.00 |
| Rice Ranch..... | 14 | Nov. '09 | .01 | 3,000.00 | 87,000.00 |
| Royalty..... | 12 | Nov. '09 | .02 | 400.00 | 7,200.00 |
| S. F. & McKittrick..... | 19 | Nov. '09 | .30 | 15,000.00 | 280,000.00 |
| Sauer Dough..... | 45 | Nov. '09 | .05 | 9,975.00 | 492,366.00 |
| Sesnon..... | 4 | Nov. '09 | .15 | 15,000.00 | 60,000.00 |
| Silver Tip Oil Co..... | 1 | Oct. '09 | .10 | 7,500.00 | 7,500.00 |
| Sovereign..... | 16 | Oct. '09 | .01 | 5,000.00 | 85,000.00 |
| Sterling..... | 21 | Sept. '09 | .25 | 62,500.00 | 684,500.00 |
| Superior..... | 10 | Nov. '09 | .01 1/2 | 7,500.00 | 52,500.00 |
| S. W. & B..... | 7 | Sept. '09 | .01 | 3,770.00 | 41,470.00 |
| Thirty Three..... | 58 | Sept. '09 | .30 | 30,000.00 | 670,000.00 |
| Traders..... | 1 | Nov. '09 | 1.00 | 11,550.00 | 123,700.00 |
| Union..... | 160 | Nov. '09 | .50 | 124,813.00 | 5,869,003.15 |
| United Petroleum..... | 99 | Nov. '09 | .50 | 40,375.50 | 2,017,457.93 |
| Wabash..... | 23 | Nov. '09 | .01 | 3,000.00 | 108,000.00 |
| West Coast (pfd.)..... | 3 | Nov. '09 | 2.00 | 20,816.00 | 62,448.00 |
| Western Union..... | 1 | Dec. '07 | 2.00 | 20,000.00 | 484,951.00 |
| West Shore..... | 47 | Dec. '08 | .05 | 5,000.00 | 235,000.00 |

Total dividends paid to date..... \$26,704,036.85

Total dividends paid by the above companies for November 1909..... 613,349.43

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

CONVEYANCE OF MINING LAND.

A deed purporting to convey "all minerals underlying the land described," was held not to be a conveyance of the natural gas thereunder, where, taken in connection with all the evidence, it appeared that the parties did not intend a conveyance of the gas.

McKinney v. Central Kentucky Natural Gas Co., (Ky.) 120 S. W. 314, June '09.

LOCATION OF MINE—FAILURE TO PERFORM ASSESSMENT WORK—ADVERSE POSSESSION.

A person who enters upon the mining claim of another during the year within which the owner of the claim is required to perform the assessment work, and who holds possession thereto, adversely to such original holder, will not be heard to object that such original holder had not performed the annual work required by law.

Madison v. Octave Oil Co., (Cal.) 99 Pac. 176, Dec. '08.

MINERAL LAND—WHAT CONSTITUTES.

It is not sufficient to render lands valuable for mineral, under the United States Statutes, reserving from sale lands valuable for minerals, that there is some trace of mineral on such land, but there must be minerals in such quantities as to justify the expenditure and effort to recover them. However, it is not necessary that minerals of sufficient amount and value to allow immediate profitable working be shown to exist in the land, but it is enough if the vein or deposit has a present or prospective commercial value.

Madison v. Octave Oil Co., (Cal.) 99 Pac. 176, Dec. '08.

RIGHTS IN SUBTERRANEAN MINERAL WATERS.

Subterranean mineral waters are regarded in law as minerals in respect to their use and enjoyment without reference to the quantity of salts and gas which may be in solution. An adjoining proprietor was entitled to equitable relief independent of any statute to prevent another proprietor from increasing the flow of percolating mineral waters and gas by means of pumps, so that he obtained a greatly increased proportion of a common supply at the expense of such adjoining proprietor for the purpose of supplying a public market with gas, and turning the mineral water to waste.

Hathorn v. National Carbonic Gas Co., (N. Y.) 87 Northeast. 504, Feb. '09.

MINING CORPORATION—APPOINTMENT OF RECEIVER.

In an application for the appointment of a receiver for a mining company, the evidence showed that at the time of the trial the mining property of a mining corporation, including the mines, the development work, and the machinery, had cost the company more than \$40,000; that they were estimated to be worth at least \$50,000, and that the mines were being operated and were producing between six and seven tons of ore per day at a net profit of \$4 per ton, and that the total indebtedness of the corporation was about \$4000. It also appeared that the creditors of the corporation were not complaining. This did not show the insolvency of the corporation sufficiently to justify the appointment of a receiver. And the fact that the directors had ordered the payment of a salary of \$100 per month to the president as manager of the mines and that the president had applied certain sums in payment of his expenses for attending the meetings of the corporation, and the fact that certain stockholders upon inquiry at the main office, were not furnished with all the information they desired, and did not obtain copies of the by-laws when demanded, were not such acts as would constitute mismanagement sufficient to justify the appointment of a receiver of a solvent corporation.

Secord v. Wheeler Gold Min. Co., (Wash.) 102 Pac. 654, June '09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

ORE DRESSING. By Robert H. Richards. Vol. III and IV. Pp. 1199—2052, ill. Index separate. McGraw-Hill Book Co., New York, 1909. Price, \$5 per volume.

A TEXT BOOK OF ORE DRESSING. By Robert H. Richards, assisted by Earl S. Bardwell and Edwin G. Goodwin. Pp. 702, ill., index. McGraw-Hill Book Co., New York, 1909. Price, \$5.

The great treatise on ore dressing by America's dean of ore dressers is now complete, and is rounded out by a comfortable summary suitable for classroom use as well as for a *vade mecum*. Robert H. Richards has done for our day what Rittinger did for the mining world of more than half a century ago. Like Rittinger he has produced a work of permanent value, a technologic classic. Though the art will continue to advance in perfection, the work of these two masters is fundamental, and will live. Richards has contributed more original knowledge than his predecessor. His experimental investigations have covered the field of concentration with the aid of water so fully that little remains to be done except in the study of some of the more obscure phases of the settling of solids from suspension, and it is reasonable to suppose that Mr. Richards will presently throw light upon these problems in a supplementary volume. Perhaps the most notable service rendered by the author has been the exhaustive study of the principles of jigging and of hydraulic classification. He gives his final dictum in favor of sizing as a preliminary to jigging, while admitting the practical efficiency of the English system of treating material roughly sized between wide limits. His own contribution to practical jigging has been the design and successful development of a jig which dispenses with reciprocation, the water being forced constantly upward by rapidly alternating impulses. The result has been to increase the cleanness of product obtained, and to enormously augment the capacity per unit of area in the jig. He has also developed a hydraulic classifier in which a remarkably successful attempt has been made to overcome the difficulty of interfering currents by imparting a rotary motion to the separating water-column.

In the discussion of ore-crushing in Volume III, occur important summaries and analyses of the latest studies of the subject. The work of Philip Argall upon roll-crushing is thoroughly reviewed, giving results reached concerning the relation of speed to size of material fed, and of the mechanical details which have proved most important. Anyone familiar with roll-crushing will appreciate the difficulties which have arisen in the use of these machines from imperfect design and construction, and the discussion given here will accordingly be particularly welcome. The work of Courtenay De Kalb on the laws of crushing is also stated in large detail, and the principal facts determined as to how ore-particles are crushed are set forth with the aid of diagrams and curves. The theory of tube-mill action is elaborately explained, due credit being given to the researches by H. A. White; and the mathematical analysis of the power required for crushing, as worked out by E. A. Hersam, is also reproduced. The chapters on stamp-mills are replete with data; and there is a review of all the recognized systems of crushing. Other chapters deal with sizing screens, and the principles of screening, in which the later improvements are dealt with in detail. A chapter on miscellaneous processes of separation gives a discussion of magnetic and electro-static concentration, with many illustrations, and all the flotation processes which are gaining in favor steadily. A chapter of great practical merit is a summary of principles and outlines of mills, followed by another on general ideas on milling, in which is treated the question of power-tests, water consumption, percentage of extraction, cost of erecting mills, working costs, testing for methods, and appliances suitable to given ores, and regular mill-testing. The work is absolutely indispensable to any student of milling operations. A large part of Volume IV is given up to details of milling plants, constituting a most useful summary.

The text book is wholly admirable. Although it contains a reprint of much that appears in the larger treatise, it also comprises new matter, and the gathering of the whole subject into this form makes a work of great value for ready reference. Mr. Richards has performed a service of enormous benefit to the mining world in the preparation of these splendid volumes. It has been a labor of love. By no possibility can the cost ever be returned to the author, and he deserves the honor and gratitude of his professional brethren throughout the world for his masterly and self-sacrificing labors.

A STUDY OF THE OPEN HEARTH. By Harbison-Walker Refractories Co., Pittsburg, Pa., 1909. Published by the Harbison-Walker Refractories Co. for private circulation.

A better example of advertizing in an effective manner would be hard to find than this little book. It is produced in the form of an *édition de luxe*, handsomely printed on elegant paper, and tastefully bound in limp leather. There is no mention from cover to cover of any article which the company has to sell, and its own products are not even mentioned in the text of the treatise; but no one can read this scholarly little book on furnace construction and maintenance, and on the metallurgical operations in connection with the basic and acid open-hearth steel processes, without feeling that the company responsible for its authorship and publication must be competent to render effective aid to those in need of materials for furnace work. The open-hearth process is today producing more steel in the United States than the bessemer process, the figures for 1908 being respectively 7,780,872 and 6,116,755 tons. The statement is also made that it is wholly improbable that any new bessemer plants will ever be erected. The discussion of furnace construction, materials for walls, roof, and bottom, and the method of building and smelting in bottoms, is wholly admirable. It should be of great service, by way of suggestion, to anyone having responsibility for furnace work in connection with the smelting of other metals. The difficulties experienced with different refractory furnace linings are well set forth. No mention is made of the methods employed for sintering chromite in Europe, nor of recent promising attempts in this country. The virtues of magnesite are explained, and analyses of such material given.

REVISTA ECONOMICA. Boletín Mensual. Tegucigalpa, Honduras, Central America.

It is not often that one sees so well edited a periodical in Latin America as this new journal, which has undertaken to forward the welfare of Honduras. It is full of interesting information on practical affairs, agriculture, mines, finance, and communications. Typographically the journal is as remarkably good as is its editing. The work is under the direction of Baron de Franzenstein, who is president of the Economic Society of Tegucigalpa.

MODERN PRACTICE IN MINING. VOL. II. THE SINKING OF SHAFTS. By R. A. S. Redmayne. 8vo., Pp. 275, ill., index. Longmans, Green & Co. Price, \$2.25.

This is a thoroughly practical book describing in detail methods used in sinking English colliery shafts. It is well printed and bound, but is marred by being written in a language so full of localisms as to be in parts almost unintelligible except to the engineer who already knows English methods so well as not to need the book.

EIGHTEENTH ANNUAL REPORT, BUREAU OF MINES (ONTARIO). Vol. XVIII, Pt. 1, 8vo., ill., index. Toronto, 1909.

As is usual the report of this Bureau is full of interesting and valuable papers. T. W. Gibson contributes a statistical review of the mineral industry for 1908, showing a total production of \$25,019,373. This is followed by a general account of the mines of Ontario by E. T. Corkill, and a series of papers descriptive mainly of the various iron ranges.

MANZANO GROUP OF THE RIO GRANDE VALLEY, NEW MEXICO. By W. T. Lee and G. H. Girty. Bull. 389. Pp. 120, pl. 12. Washington, 1909.

COMPANY REPORTS.

LAKE VIEW CONSOLS, LTD.

The gold mine at Kalgoorlie, Western Australia, belonging to Lake View Consols, Ltd., continues to make a fair profit, though the ore is of much lower grade than in the earlier days. During the year ended June 30, the 70 stamps treated 98,962 tons without amalgamation. The crushed product yielded 9606 tons of concentrate, which was roasted, slimed, and cyanided, yielding 15,854 oz. of gold, while the remaining 89,356 tons were ground to slime and cyanided, yielding 10,839 oz. gold. In addition 111,464 tons of old slime were treated, yielding 6760 oz. gold, and 232 oz. were recovered from cyanide slags. The total production was, therefore, 33,865 oz. realizing £145,464. The working cost of treating the current production, including development, was £1 1s. 3d. per ton, and the recovery was £1 3s. 3d. The cost of treating the old slime was 2s. 6½d. and the recovery 5s. 2½d. The total working expenditure was £119,718, leaving a profit of £25,746. The amount treated in the mill was less than in the previous year, when 129,110 tons were crushed. Development during the year has brought to light 91,475 tons additional ore, but no new orebody has been discovered. The total ore reserves on June 30 were 172,050 tons. The company, in addition to operating the mine, owns 60,675 shares in Broken Hill South Blocks and has a large holding in the Burma Mines, Ltd., also shares in several smaller companies. The most recent speculation is in connection with South American oil. There is a reserve fund in sound investments amounting to £47,000. The interest in Golden Links terminated in April and the ore from this mine is not now being treated at the mills. The total profit made by the company during the year under review was £33,075, out of which £17,479 has been paid as dividend, being at the rate of 5% on the paid up capital. During the year the company has had a dispute in connection with the price of its water supply. In 1906 the mine was certified as low grade, and therefore entitled to receive water at 3s. 6d. per 1000 gal., but since then attempts have been made by the public authority to rescind this arrangement and charge 5s., the full rate.

Murex Magnetic Process.

Written for the MINING AND SCIENTIFIC PRESS

By ERNEST LEVY.

The Murex magnetic process is for the separating and concentrating of the valuable content of an ore by taking advantage of the affinity of certain oils for the metallic sulphides. The oil is charged with finely divided magnetite or some other magnetic mineral or metal, making a homogeneous mixture. This is added in suitable proportions to the crude ore and agitated in a mixer, the ore having been previously crushed to a size found necessary for liberating the metallics from the gangue, until the sulphides are coated with the magnetic paint. With some ores it is found advisable to add a small percentage of acid before agitating. The whole mixture is then passed at a suitable speed between the poles of an electro-magnet arranged with a moving belt which carries off the magnetic particles; the latter are thereby withdrawn and separated from the remainder and are collected, while the gangue is run to waste. The power necessary for the magnet and agitators is extremely low. The magnetite or magnetic mineral can be recovered from the concentrate after removal of the oil, and can be utilized again. The quantity of oil used is small, varying in amount with the ore being treated. Various oils are applicable to the process, including the residuum oils, producer-gas oil, gas residuum, creosote, and so forth. It will thereby be understood that the necessary adjuncts to the process show a large range, and in any district the oils and magnetic minerals most easily and cheaply procurable can be used.

A second feature of the invention consists in mixing a certain solution with the concentrate, which has the property of breaking the adhesion between the component minerals, and affording a more perfect separation of those minerals in the case of further concentration. As an example,

if a zinc-lead ore had received its first concentration by the Murex magnetic process, whereby a combined lead-zinc concentrate was produced, this could be mixed with the solution and passed over some form of concentrating table. By this means a much cleaner lead concentrate and a much cleaner zinc concentrate would be produced than would have been possible had the solution not been employed. Tests have been made on various ores and good results achieved. It is proposed to erect a testing works in British Columbia, probably at Rossland, where ores will be treated, and all information supplied.

Silver Consumption and Market.

Largely because of India's demand, silver prices have improved somewhat. Silver for 1908 exported from London to India was \$45,073,535, compared with \$51,865,696 for 1907 and \$73,898,224 for 1906. There has been a progressive decrease in India's demand, due largely to changes in the monetary system, which put the metal at a disadvantage and also to the less favorable agricultural condition. Of a world's consumption of 92,568,300 fine ounces of silver, British India took 34,848,500. The various countries as consumers of both silver and gold in the arts and industries compare:

| | Gold. | Silver, fine ounces. |
|---------------------------|---------------|-------------------------|
| United States | \$33,549,500 | 22,137,200 |
| Great Britain | 14,500,000 | 7,500,000 |
| France | 15,850,700 | 8,252,900 |
| Germany | 11,000,000 | 6,500,000 |
| Switzerland | 7,310,600 | 2,218,300 |
| Italy | 3,000,000 | 2,000,000 |
| Russia | 5,700,500 | 3,915,300 |
| Austria-Hungary | 3,358,800 | 1,923,700 |
| Netherlands and Belgium.. | 1,500,000 | 1,000,000 |
| Sweden | 465,200 | 257,200 |
| Colombia | 15,000 | 15,200 |
| Other countries | 3,000,000 | 2,000,000 |
| Total | 99,250,300 | 57,719,800 |
| India (British) | 35,796,200 | 34,848,500 |
| Grand total | \$135,046,500 | 92,568,300 |

Samuel Montague & Co.'s London silver circular says: "China continues the mainstay of the silver market. There is room for suspicion that a heavy fall of exchange with China would be fraught with danger to the smaller importing firms, and that a judicious support by the exchange banks is being exercised to prevent inconvenience to these firms until import business resumes activity. China is endeavoring to become more independent of the West, desiring to profit by its own labor and secure a fair share of the world's increasing wealth. The Prince Regent has instructed the Grand Council to issue a proclamation exhorting that future railways should be financed and controlled by the natives of China. There is also a tendency to import raw material into China in preference to the manufactured article—notably cotton."

Standard Oil Profits.

The following table shows the net profits, dividends, and surplus after dividends of the Standard Oil Co. from 1882 to 1909, inclusive, earnings for the years 1907, 1908, and 1909 being estimated:

| Year. | Profits. | Dividends. | Surplus after dividends. |
|---------------------|-----------------|---------------|-----------------------------|
| 1909 | \$80,000,000 | \$39,335,320 | \$40,664,680 |
| 1908 | 80,000,000 | 39,335,320 | 40,664,680 |
| 1907 | 85,000,000 | 39,335,320 | 45,664,680 |
| 1906 | 83,122,251 | 39,335,320 | 43,786,931 |
| 1905 | 57,459,346 | 39,335,320 | 18,124,026 |
| 1904 | 61,670,110 | 35,188,266 | 26,481,844 |
| 1903 | 81,336,994 | 42,877,478 | 38,459,516 |
| 1902 | 64,613,363 | 43,851,956 | 20,761,407 |
| Total | \$593,202,064 | \$318,594,300 | \$274,607,764 |
| 1882 to 1902, inc.. | 456,240,000 | 351,883,000 | 104,407,000 |
| Total | \$1,049,442,064 | \$670,427,300 | \$379,014,764 |

Arizona Copper Co.

A correspondent of the *Finnacial Times* brings out the fact that notwithstanding the strain of large capital expenditures the Arizona Copper Co. has run a close dividend race in recent years with Rio Tinto.

| | Rio Tinto, Arizona, | |
|------------|---------------------|-----|
| | % | % |
| 1904 | 70 | 60 |
| 1905 | 80 | 75 |
| 1906 | 110 | 105 |
| 1907 | 87½ | 75 |
| 1908 | 55 | 50 |

Undoubtedly the great strength of the Arizona company for the future lies in its small ordinary share capital, as compared with the output of copper. The following comparison is interesting:

| | Ordinary share capital. | Output tons (2000 lb.). | Capital per ton copper produced. |
|-----------------|-------------------------------|-------------------------------|--|
| Arizona | £379,974 | 17,000 | £22½ |
| Rio Tinto | 1,875,000 | 39,000 | 48 |
| Anaconda | 6,000,000 | 50,000 | 120 |
| Mt. Lyell | 1,200,000 | 8,000 | 150 |

Commercial Paragraphs.

The U. S. FLEXIBLE METALLIC TUBING Co. has established a branch office at 425 First National Bank Bdg., Houston, Texas.

The HOOKER ELECTROCHEMICAL Co. has purchased the plant and business of The Development & Funding Co. The same interests will control and manage the business as heretofore.

THE DENVER ENGINEERING WORKS Co. announces the appointment of Walter H. Trask, Jr., as district sales manager at Salt Lake City to succeed Carroll Helmick, resigned. Mr. Trask is a graduate of Massachusetts Institute of Technology and has been a salesman at the company's main office in Denver for the past two years.

THE PARTRIDGE HOT BLAST SMELTER Co., El Paso, Texas, has sold a 10-ton smelter to the Bonney Mining Co., at Lordsburg, New Mexico, and a 15-ton plant to J. B. Heymes, at San Lorenzo, Sinaloa, Mexico. A test run on 10 cars of ore from the Helvetia company of Pima county, Arizona, is being made at the 25-ton plant of the smelter company at El Paso. If satisfactory results are obtained a 300-ton plant will probably be built.

Catalogues Received.

UNION STEAM PUMP Co., Battle Creek, Michigan. Catalogue B. 'Air Compressors'. 72 pages. Illustrated. 6 by 9 inches.

THE JEFFREY MFG. Co., Columbus, Ohio. Catalogue No. 81. 'General Chain Catalogue'. 368 pages. Illustrated. 6 by 9 inches.

WESTINGHOUSE ELECTRIC & MFG. Co., Pittsburg, Pennsylvania. Circular 1181. 'Portable Direct Current Ammeters and Voltmeters'. 8 pages. Illustrated. 7 by 10 inches.

THE CYCLONE DRILL Co., Oroville, Ohio. 'Diamondite Core Drills'. This little booklet describes this device and discusses the advantages of prospecting with drills compared with shaft sinking. 8 pages. Illustrated. 8 by 11 inches.

BISMUTH has been produced in a small way in the United States. Until the last two years these ores have been shipped abroad for reduction, but plants at St. Louis, Missouri, and Grasel, Indiana, are now recovering bismuth from lead ores. Bismuth is contained also in ores of other metals than lead, but most of it that is now mined passes unrecovered out of the smelter flues. It is estimated that 880 lb. of bismuth are thrown off every day in the smoke and gases of the Washoe smelter. Bismuth is used in low-fusing alloys such as are employed in the automatic sprinklers that are common in large warehouses, and in solders, some of which, it is said, can be used under hot water.

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TABLE OF CONTENTS.

| | |
|--|-----------------------|
| EDITORIAL: | |
| Notes | Page. 779 |
| Strike at the Homestake Mines..... | 780 |
| Outcrop of Orebodies | 781 |
| ARTICLES: | |
| Outcrop of Orebodies | William H. Emmons 782 |
| Stripping a Vein by Hydraulicking.... | A. F. Hughes 788 |
| Ozokerite in Utah..... | H. W. MacFarren 789 |
| Seven Troughs District of Nevada.. | F. L. Ransome 790 |
| DISCUSSION: | |
| Theory of Volcanic Action and Ore Deposition | Thorington Chase 794 |
| The Qualified Mining Engineer..... | John M. Nicol 794 |
| Modern Quicksilver Reduction..... | Arthur Feust 795 |
| The Copper Combination | 809 |
| Production of Gold and Silver in the United States | 810 |
| for the Calendar Year 1908..... | 810 |
| Copper Prices | 810 |
| CONCENTRATES | 796 |
| SPECIAL CORRESPONDENCE | 797 |
| GENERAL MINING NEWS | 803 |
| THE PROSPECTOR | 793 |
| DECISIONS RELATING TO MINING..... | 809 |
| DEPARTMENTS: | |
| Personal | 808 |
| Market Reports | 808 |
| Publications Received | 809 |

EDITORIAL.

SAVING at the Washoe smelter is reported to amount to 76 to 80 per cent of the value of the crude concentrating ore. The extraction at Great Falls is less and at the Clark smelter is said to be 70 per cent.

ELECTROLYTIC copper sold as high as 13.57 cents in November. The average price for the month was 13.125 cents per pound. Sales of over 300 million pounds were made, some orders being booked for delivery as far ahead as March 1. Meanwhile the surplus was increased by 14,304,640 pounds.

TRADE excursions are becoming common. The Japanese have just been visiting us, and now business men of the West Coast are to pay a call to Mexico and Central America. In January and February the steamer *Erna* of the Jebsen line is to make the round trip, going as far south as Corinto. Journeys are to be made inland to the principal cities of Mexico, Guatemala, Salvador, and Nicaragua. Such an excursion should have an important influence in promoting good relations and stimulating trade.

AUSTRALIA is well served by mining journals and has a number of excellent publications. The *Australian Mining and Engineering Review* has just celebrated its second birthday with an excellent review number. In the seventy years since gold was discovered Australasia has produced ores valued at £714,760,000. Of this, gold has amounted to over 71 per cent. In 1908 the combined total mineral output of the Commonwealth and New Zealand amounted to £28,409,576. It is difficult to determine what part of this great development is due to the activities of the mining journals, but the portion must be large. With the excellent prospects for an increasingly important mineral industry, our contemporaries in the South Pacific should find a large field for usefulness. The *Review* seems to be finding an important and deserved position among them.

ANNOUNCEMENT of serious inroads upon the world's available supply of copper ore, that is attributed to Mr. J. Parke Channing by our New York correspondent, will awaken anxiety in some quarters and will quicken speculation in others. Mr. Channing is possessed of superior information on the subject; but in a world still incompletely explored, is it not a bit unsafe to cry exhaustion of resources? The British alarm over the coal-supply on the 'tight little island' was calmed by deeper drilling. Brazil looms up with an iron supply which will hold down the prices of iron-ore lands in many countries; we have yet to hear from enormous areas of South America and Africa, where only the conspicuous cop-

per deposits are known. Mr. Channing would not excite undue cupidity for merger stock, when made available, but, whether right or wrong, his statement, if unmodified, will develop some interesting features in the market.

Strike at the Homestake Mines.

After a period of pleasing calm, warfare between the Western Federation of Miners and mining capital has broken out anew. The strike which has been called at the Homestake mines, in South Dakota, is a signal by which we might feel assured of returning financial vigor, if other evidences were wanting. Strikes are usually a sign of prosperity, not of hardship. During the months after the financial bubble burst in 1907 the Western Federation subsided into inconspicuous good behavior. Its very existence would have been generally forgotten save for a struggle by the faction of law and order to gain control of the organization at the last election of officers. The Western Federation in itself is not necessarily bad. It is capable of becoming an engine for the doing of useful work. It all depends upon the spirit of those in control. The dominant influence of the moment represents that active minority which contrives to rule in so many organizations of men; the kind of influence that produces political corruption, and which stands inevitably and everywhere for illicit gain. Under broad and intelligent guidance the Western Federation of Miners could prove at once the friend of the miner and of the mine operator. The miner wants fair wages and fair treatment, and it is his right to obtain them, by organization or by other lawful means. The mine operator wants efficiency and co-operation toward an economic result. If the union will recognize efficiency as in the last analysis the reason for protection, and will acknowledge responsibility for the capable discharge of duty as a condition for sustaining its members in their differences with employers, the mine operators could find no better labor bureau from which to draw their supply of workers than from the organization itself. It is because the Western Federation declines to recognize efficiency, and instead of offering the kernel of skilled labor would compel acceptance of a mere empty shell of unionism, that it is not accepted and dealt with as an economic agent in an economic world. We do not understand that Mr. Thomas J. Grier, the superintendent of the Homestake, has received from the union intimations of any other purpose than that of excluding non-union men from the payroll. No standard of efficiency is proposed; submission means that no man may be discharged without raising ugly questions with the committee of the 'local'. As Mr. Grier well said, "The Homestake sees in this a strained effort to completely unionize this camp, a desire on the part of those responsible for the movement to take from the company the control of its own property." That is what the demands of Mr. Moyer's Western Federation of Miners have always meant. The Homestake is one of the greatest mines in the world; it has been operated for over thirty years; most of that time under the direction of the present superintendent; and this is the first clash

it has had with its employees. After such a record of cordial relations with the laboring man it will be hard to convince the public that the company has suddenly grown perverse and has dealt unjustly. Being a camp of large proportions, in which unionism had not become triumphant, the Homestake alone employing over fifteen hundred men, it represented nearly virgin soil for the Denver clique that controls the Federation. It meant the possibility of a large sum from initiation fees, and continuing revenue. The times were prosperous, and men were not clamoring for work. Moreover the crude distorted socialistic principles which have been applied in the Western Federation involve a pending strike in some quarter as *prima facie* evidence of performing a useful function for its members. It must be 'doing something' to demonstrate a reason for existence, and, in the narrow conception of the Denver ring, that means to be engaged in a war with capital. We hope the time will soon come when the Federation will be directed by wise counsels, and emulate some of the Eastern unions which have discovered that prosperity necessitates actual community of interests between employer and employee. Not long ago the Illinois branch of the United Mine Workers of America was represented on a powder commission appointed under agreement between the operators and the miners to settle all disputes relating to the use of powder underground; and still more recently a commission to revise the mining code of that State has been created by an Act of the Legislature which requires the appointment of three miners, who would necessarily be members of the union, three operators, and three disinterested persons. In Indiana some time ago fifty-two members of a miner's union were expelled for bringing action in a matter of a fine assessed against them for causing a 'stampede strike', and the union, as an organization, paid the fine which was levied under the terms of the contract. This shows what unionism may become as a responsible combination of workingmen. There must always be a *quid pro quo*. The ends of society are subserved by interacting helpfulness. To draw another lesson from the wise co-operation of labor and capital seen in Illinois, we may call attention to an adjustment of difficulties whereby Association mines employing union men are guaranteed the right to employ non-union men if they desire, this being understood to be a mere protection against charges of conspiracy, since the union men were conceded the right of not working with non-union men. When labor unions recognize mutual responsibilities, so that operators find it profitable to maintain close contract relations with them, and when States seek their advice in revision of the laws, a field of usefulness is revealed which has never yet been suggested by Mr. Moyer's personally conducted Federation.

A strike must be for the rectification of wrongs in order to win public sympathy. There is no appeal to the general conscience in a mere demand for unionization of a camp. The company must be shown to have failed in its duty somehow, and this has not been alleged in any utterances by Mr. W. E. Tracy who was sent from Denver to attend to the tithe-gathering at Lead City. The Homestake company

has enjoyed a long career of honest mining for the profit there was in it. The insiders have held their stock and have taken their dividends. They have never gone into the market to shear the lambs and make the public help to cover temporary financial difficulties. The opportunities thus to play the market have been many, but the Homestake has been conducted on conservative lines after the manner of any reputable business enterprise. It commands the confidence and respect of the people, and the union will have to assume a new rôle in order to win sympathy in its unprovoked demand for recognition.

Outcrop of Orebodies.

Prospecting as an industry avails itself but little of geologic knowledge. In districts where important mines have led to careful investigation of the geology of the ore deposits advantage has been taken of the facts thus ascertained, but only in a broad and general way have the lessons learned in one district been applied in the prospecting of new regions. This is partly because conditions at one place, superficially similar to those existing at another, do not necessarily involve the accompaniment of workable deposits of metalliferous ores. A number of notable failures have been made where geologists have undertaken to predict the presence of metals from surface indications. It must be recognized that such predictions can be based only upon analogy, and analogy is not proof. It here lacks the value of an essential relationship between vein enrichment and petrographic conditions. On the other hand, relationships do exist which enable trained observers to declare definitely in favor of or against the probabilities of the presence of ores, and these are revealed by the outcrops of veins and their associated country rock. In this view the highly suggestive paper concluded in this issue on 'Outcrop of Orebodies', by Mr. William H. Emmons, one of the younger men of the Geological Survey, recently called to a professorship in the University of Chicago, will be exceedingly welcome. It is the most thorough attempt yet made to generalize upon these phenomena. A most significant point is the topographic expression of lode-deposits. Veins which outcrop prominently, by virtue of superior resistance to erosion, offer no difficulty, but even in regions of acid eruptives, and where silicification of a lode has been a feature in its formation, the vein is not always harder than the enclosing rocks. The great majority of orebodies weather more rapidly than the country rock, and hence occupy depressions on the surface, or remain entirely inconspicuous except when indicated by the presence of characteristic alteration-products. Since pyrite is almost invariably present in ores of gold, silver, and copper, the traces left by its oxidation become of prime value, and these phenomena have been well set forth by Mr. Emmons. He has not, however, dwelt at much length upon the alterations of the gangue minerals in lodes.

Deductions as to the character and size of deposits from their outcrops are eminently risky. The aim of the geologist is naturally to see as deeply into the ground as possible; that is what the laity expect and what, in some degree, it demands as a measure of the worth of the economic geologist. To encourage such

expectations is, however, unfair both to those within and to those outside of the profession. The genesis of every deposit has its own peculiarities; each has its habit and characteristic geologic association, dependent upon the chemical relations of the surrounding rocks and the media whereby the metals were brought into their present position. It is in the diagnosis of the case as revealed by a study of the patient that the geologic doctor can point the way to successful development and save the expense of blind and futile groping. We commend the effort of Mr. Emmons, and of all geologists, to render prediction more trustworthy, but we are sceptical as to the wisdom of attempting to declare whether a vein will be deep or shallow, wide or narrow, reasoning only from hints given by its outcrop.

Aside from the main question of outcrops Mr. Emmons has been led to consider the means whereby gold may have been removed from or concentrated in the upper portion of veins. The little that is known of these processes, and the failure of geologists to clarify their discussion of them by chemical equations, may serve as another argument for the need of a research-laboratory under the auspices of the United States Geological Survey, sustained by adequate appropriations. It is useless to attempt it with inadequate funds. But that is another story—one which merits the consideration of Congress, which needs only to be convinced of an economic necessity to appropriate money in generous fashion. Mr. Emmons has endeavored to draw conclusions from what is known of gold-reactions in vein alteration and erosion that may be tersely re-stated as follows: when gold veins contain appreciable amounts of manganese, accompanying placer deposits need not be looked for; and where manganese is absent the gold is eroded with the rocks and enriches the gravels. We do not know of any important cases to the contrary, and the deduction is of economic value to the searcher after mineral wealth. Just how the gold is dissolved and carried beyond reach of denuding agencies in manganeseiferous veins is not precisely demonstrated. Solving the problem would throw light on other probabilities. Gold is slowly soluble in ferric chloride; moderately soluble in all ferric and cupric salts; and quite readily soluble in mixtures of the latter with ferric chloride. It is also readily dissolved by sulphuric acid in the presence of manganic acid (H_2MnO_4), which occurs in nature as the mineral manganite. In the oxidation of pyrite, marcasite, and pyrrhotite, a portion of the sulphur separates as sulphuric acid. Reagents for accomplishing the solution of the gold are consequently seen to be present. Whether the gold enters the solution as a sulphide or an oxide is of interest, particularly in view of the fact that apparently it always precipitates in the metallic form. Knowledge of the entire cycle of reactions is needful in order to admit of predictions as to the conditions under which re-deposition may be expected. The article by Mr. Emmons is full of suggestions which should awaken generous constructive criticism from students of economic geology. The world needs all the light it can get upon interpretation of outcrops, to the end that prospecting may be conducted in a less haphazard manner than in the past.

OUTCROP OF OREBODIES.

Written for the MINING AND SCIENTIFIC PRESS
By WILLIAM H. EMMONS.*

(Continued From Page 754.)

Outcrops of gold deposits. Gold deposits undergo important changes at the surface of the earth. The work of Doelter, Becker, Stokes, Lenher, and others indicates that gold is dissolved by concentrated solutions of many salts which are found in earth-waters, but in the main at temperatures near or above the boiling point of water. Reactions under such conditions cannot have been important in changing outcrops of gold deposits, for the maximum temperature at which the reactions take place is known to be about room temperatures, and the pressures do not greatly exceed 15 lb. per square inch. Ferric sulphate, which is usually present in mine-waters, does not dissolve an appreciable amount of gold at or-

cess goes far enough it may result in depletion of the metal. This depends upon the rate of solution of the mineral components of a gold deposit. Take the commonest type composed of quartz, pyrite, and gold, the precious metal being contained as free gold in both the pyrite and quartz. As this ore weathers, pyrite is broken down first through oxidation. The sulphur and some of the iron are carried away as iron sulphate. The amount so removed is considerable. In the Granite-Bimetallic mine it is 0.6 of a ton every 24 hours. But a large part of the iron remains behind as limonite. Silica is dissolved and carried away, as is also the relatively insoluble limonite. Gold may be dissolved if chlorides and manganese are present and to some extent in their absence. If gold is not dissolved there is enrichment due to the removal of other constituents. If it is dissolved in greater proportion than the base elements, the outcrop is impoverished. The rate of solution of gold, and consequently the depth of the leached zone, and

the presence or absence of associated placers, depends upon the size of the gold particles, and probably to a considerable extent upon the presence of manganese oxide in the oxidized ore. Lindgren, comparing the Mesozoic gold deposits of the Pacific Coast and elsewhere with the gold deposits associated with the Tertiary eruptions⁴, notes that important placers have been derived from the former, and that the Tertiary deposits of the Great Basin and elsewhere have contributed but little placer gold. The gold, being in a more finely divided state in the late Tertiary deposits is more readily dissolved, or is more likely to be carried away.

In the Philipsburg quadrangle, Montana, I have had an opportunity for examining two types of gold-bearing deposits within a relatively small area. In one of these (Granite-Bimetallic lode), the gold is fine,

and considerable manganese carbonate is present in the primary ore. This, oxidizing, gives a notable amount of chocolate-colored manganese oxide, which is present in nearly every outcrop and in the oxidized zone to considerable depths. There are no placers associated with these deposits, and the outcrop carries less gold than the lode at a depth of 50 to 200 ft. below the surface. In the other type of deposit (Cable mine), gold is for the most part less finely divided, and manganese oxide is entirely absent or extremely rare. These deposits yield rich placers and they have been stoped to the surface. The leached or impoverished zone varies from nothing to 50 ft. and begins rarely more than 30 ft. below the surface. In the Comstock lode, which has yielded many millions in gold, but no relatively important placers, much manganese oxide is found in the upper levels. According to King⁵, "A zone of manganese oxide occupies the entire length of the lode from the outcrop 200 ft. down." Tonopah, Bullfrog, and many other camps in Nevada, may be cited as examples where there are no rich placers, and

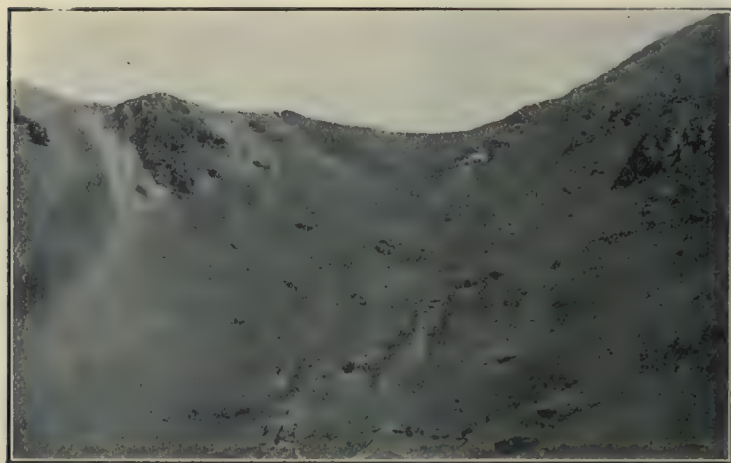


Fig. 7. Outcrop of Veins Near Lake Como, Near Silverton, Colorado.

The lodes in the foreground are siliceous deposits in altered andesite and latite.

(Photo., Ransome, U. S. G. S.)

dinary temperatures, but if ferric chloride is present also, and especially if manganese oxide is present, gold is dissolved much more readily, as has been shown by a number of investigations, among them Don, Rickard, and Lenher. Native metals, oxides, soluble reducing salts, and some forms of carbonaceous matter, are known to precipitate gold from the above solutions. Indeed, of all the commoner metals, gold salts are the least soluble, consequently gold is difficultly dissolved and easily precipitated, and so gold does not travel far below the outcrop, and consequently the zone of leached oxides vertically is not extensive. There are no examples of gold deposits of proved secondary enrichment which are at all comparable in size and richness to the secondary sulphide deposits of silver and copper. It is not uncommon, however, to find the richest part of a gold deposit just at the surface or more often just a few feet below the surface and extending downward to the bottom of the oxidized zone. The process of oxidation is at first one of enrichment³, but if the pro-

*Published by permission of the Director of the United States Geological Survey.

³T. A. Rickard, *Trans. A. I. M. E.*, Vol. XXI, p. 198.

⁴*Trans. A. I. M. E.*, 1902, p. 790.

⁵'Fortieth Parallel Exploration', Vol. 3, p. 75.

where a notable amount of manganese oxide is present in the oxidized ore. In these camps, as a general rule, the outcrop, and a shallow zone below, carry less gold than the deeper oxidized ore. The same statement may apply to the Granite Mountain lode, in Montana, and to the Butte deposits. At first glance the latter seem to be exceptions to the gener-



Fig. 8. A Quartzite Lode in Altered Andesite, Valley View Mine, Tonopah, Nevada.

The outcrop and open-cut show in the foreground.
(Photo., Spurr, U. S. G. S.)

alization that manganese is unfavorable to the formation of placers and favorable to leaching, for there is considerable manganese in the Butte veins, and yet the camp was first exploited for its placer gold. As is well known there are three periods of mineralization shown by the Butte deposits, and the deposition of rhodochrosite seems to be limited to the deposits of one or possibly to two of these periods. The small amount of placer gold which has been won at Butte may well have come from the manganese-free deposits. On the other hand, the placer-yielding lodes of the Pacific Coast carry little or no manganese oxide and this circumstance may be responsible to some extent for the great accumulations of placer gold and the small amount of leaching which the deposits of this class have undergone. In general, coarse gold and freedom from manganese are favorable to the enrichment of placers and are unfavorable to the leaching of the upper part of the oxidized zone. Consequently shallow exploration, usually not more than 50 ft. in depth, is sufficient to prove the value of a deposit of this character, providing the work is done on an ore-shoot. Finely divided gold, and the presence of manganese oxide, are unfavorable to the formation of placers and are favorable to leaching of the upper part of the oxidized zone, but this does not seem to take place to any great extent much lower than 100 ft. below the outcrop of the deposit, but where there is considerable fissuring, and the ground is open, leaching of gold may extend to greater depths, and in such places it may be necessary to sink deeper to be sure that the leached zone has been passed, but for mines where gold is the only important metal sought, 200 ft. in depth seems a safe figure.

Recent inspection of a large number of stopesheets of gold mines indicates that even where gold is finely divided, and manganese is present in the veins, the majority of outcropping orebodies are

stopped to less than 50 ft. from the surface. Briefly stated, in the average gold deposit, which outcrops at the surface, the workable ore is encountered at the surface or within 25 or 50 ft. of the surface, but in some cases it is found 100 ft. below the surface, and exceptionally, 200 ft. below the surface, depending upon the fineness of the gold particles, the presence of manganese dioxide, and the amount of post-mineral fissuring.

Outcrops of silver deposits. Most silver minerals are readily dissolved by surface-waters, and the leaching may at some places extend to greater depth than the leaching of gold. Silver enters into the composition of a great many minerals, chief of which are the native metal, the halogen compounds, the sulphide, the sulph-arsenic, and sulph-antimony compounds. Silver is also contained in the sulphides of the other metals, especially in galena, pyrite, and zinc blende. A large proportion of the silver ore is of this character. At 18°C. in pure water silver salts have the following order⁶ of increasing solubility: I. Br. Cl. CO₃. C₂O₄. OH. SO₄. ClO₃. NO₃. F. The solubility of the sulphate is 0.55 grain in 100 c.c., or nearly three times the solubility of gypsum, which is commonly regarded as a soluble mineral. The silver sulphate is formed by the oxidation of the sulphide and other silver compounds or by the action of ferric sulphate⁷ on silver compounds. This reac-



Fig. 9. Outcrop of Drinkwater Vein, Near Silver Peak, Nevada.
(Photo., Spurr, U. S. G. S.)

tion takes place at the lower temperatures, and therefore may be important under the conditions at which silver ores are exposed to agents of weathering. Accordingly in the presence of sulphate-waters silver minerals are readily dissolved and carried away in solution. The sulphates in solution may be

⁶As measured in moles per litre, determined by Kohlrausch by the conductivity method.

⁷H. N. Stokes, *Econ. Geol.* I, p. 649.

reduced by sulphides* of Cu, Pb, Fe, and Zn, in which case the silver will form a secondary sulphide which is relatively insoluble and easily precipitated, or if it is not precipitated it may be carried away from the deposit in the general underground circulation.

The chloride of silver is relatively insoluble. At 18° only 0.0016 grain will dissolve in a litre of pure water, which is a small fraction of 1% of the amount of silver sulphate which is so dissolved. On account of its comparative insolubility the chloride, horn silver, will be precipitated from silver sulphate solutions in the presence of chlorides. Being relatively insoluble in earth-waters it is not easily removed, and so at many places it is present in important quantity at the very outcrops of silver-rich orebodies. As pointed out by Penrose⁹, silver chloride forms extensively in the upper part of silver-rich orebodies in the arid regions of the United States, especially in the Basin province. The earth-waters there carry much chlorine owing to the poor drainage as a result of which salt lakes and marshes have formed at many places. It is well known that salt is vaporized in sea water, just as H₂O is vaporized. It is carried down to the earth in the rains, and there is a continual circulation of NaCl from the ocean to the land and back to the ocean, just as there is a circulation of H₂O. Although the salt circulates in very small quantities, the amount is quite sufficient to form important bodies of silver chloride. The effects of the circulation are shown 100 miles inland from the sea,¹⁰ and so within 100 miles of a body of salt water we may expect to find the chlorine in rain water. Further, there is residual chlorine in some of the sedimentary rocks, and so the conditions for the precipitation of the chloride may hold at places far removed from salt water. The abundance of chloride formed is not in direct proportion to the salt present in earth-waters even when other conditions are constant, for silver chloride dissolves in an excess of the alkali chlorides, and the presence of too much salt will cause the chloride to re-dissolve and be carried away from the outcrop. Perhaps this is the reason that some silver chloride deposits are a little richer a few feet below the surface than at the outcrop. However that may be, there is a strong tendency to concentration at or just below the outcrop of the silver lode, and this is most marked in arid regions, so much so that the word 'chloriding' was very generally used in such regions for pocket-hunting near the surface in the early days of mining in the Great Basin States.

Native silver, like the chloride, is often found at the outcrop of the lodes. In nearly all deposits of the western Cordillera it is clearly the reduction-product of the sulphide, chloride, or other silver salt. Spurr, in a recent article¹¹ emphasized the abundance of native silver and the absence of ruby silver at Aspen, Colorado, where shale often forms one of the walls of the deposit. At Georgetown and other

campes near by, the ruby silver is a common and sometimes abundant secondary mineral, and the native silver relatively rare. The complete reduction of the silver salts to the native metal has here been accomplished by the shale which is rich in carbonaceous reducing agents. Native silver may, however, occur in considerable quantities in oxidized ore where no shale is present, as in the Granite-Bimetallic lode in Philipsburg mountain, and in a great many other silver lodes. The commonest type of the rich silver outcrop is composed of spongy iron-stained quartz plastered with horn silver, and carrying thin flakes of native silver. Pyromorphite, the lead chlor-phosphate, often carries silver and in Montana, Colorado, and Nevada, this mineral frequently appears in the outcrop. Silver bromides and iodides form to some extent. In pure water at 18°C., these silver salts are less soluble than the silver chloride. But since bromine and iodine are much less abundant than chlorine, the iodide and bromide of silver are not common. I have made a large number of tests of suspected bromides taken from outcrops in Montana and Nevada, and have never had a satisfactory test for bromine in any of them. The law of mass action enters here, and accordingly the halogens other than chlorine play a subordinate role in the outcrops of most silver lodes.

There are many shoots of silver ores which are not everywhere workable at the surface, and in some of these the chloride is among the silver minerals. Notwithstanding the relative insolubility of this mineral, and the general presence of chlorine in earth-waters, some of the outcrops of silver lodes are leached to a considerable depth below the outcrop. Characteristically the oxidized zone may extend from the surface to the level of the ground-water, or slightly below this level, depending largely upon the fissuring to which the ore has been subjected. In the Comstock¹² lode this oxidized zone extends in places 500 ft. below the surface, whereas at other places the sulphide continues to the surface. In the Granite and Bimetallic mines incomplete oxidation has taken place deeper still, and in the Mizpah mine, at Tonopah,¹³ some oxidation extends to a depth of 700 ft. In all of these mines the bottom of the oxidized zone is irregular, depending largely upon fracturing, and in all of them leaching seems not to have taken place to any great extent below the middle of the zone of oxides. Inspection of a number of stope-sheets of silver mines shows that most silver lodes are at some place workable at the surface; but that there is also a fairly constant horizon from 75 to 200 ft. below the surface that represents the top of the zone of workable ore. In some mines where there has been considerable fracturing of the ore since it was deposited there has been some leaching locally as deep as 400 ft. below the surface, but this depth should probably be regarded as near the maximum for silver deposits. Leaching seems to have been important on the average less than 200 ft. below the surface and unless the ground is open and the circulation very free the oxidized ore-shoot should be payable at that

*S. F. Emmons, *Trans. A. I. M. E.*, Vol. XXX, p. 177; W. H. Weed, *Trans. A. I. M. E.*, Vol. XXX, p. 424.

⁹'The Superficial Alteration of Ore Deposits', *Jour. Geol.* II, p. 288.

¹⁰T. M. Brown quoted by Clark, 'Data of Geo-Chemistry', p. 47, Bull. 330, U. S. Geol. Surv.

¹¹*Econ. Geol.*, Vol. IV, p. 301.

¹²Clarence King, *Geol. Expl. of Fortieth Parallel*, Vol. 3, Atlas.

¹³J. E. Spurr, U. S. Geol. Surv., Professional Paper 42.

depth. If an important proportion of the metals is gold, the workable ore should be expected nearer the surface than in ore where the gold is a relatively unimportant constituent.

Galena is, as already stated, less readily decomposed than pyrite, zinc blende, and antimony sulphides, and it, therefore, lingers longer in the outcrop. It is dissolved, however, for it does not usually occur in great abundance immediately at the surface, but is often found a few feet below. In Wisconsin many lead deposits have been discovered by farmers who were plowing fields and in the Coeur

the outcrop where the rock is tight. These deposits often are found at the surface, the native copper outcropping with the rock, only slightly tarnished or altered to oxides or carbonates. Where the rock is open, there is some leaching of the outcrop, but most of the deposits of this group may be worked to near the 'grass roots'.

Most of the schistose ores in regionally metamorphosed igneous and sedimentary rocks are in the Appalachian States. They are probably the regionally metamorphosed products of ores of varied character, including the fissure veins, magmatic segregations, and replacement deposits. They are, as a rule, tight and not greatly affected by movement since they were formed, consequently, they are not leached to great depth, and the primary sulphide ore usually appears at less than 100 ft. below the surface. In the Northern States where the deposits have been glaciated, the primary sulphides usually outcrop at the surface, and even where there has been some crushing the oxidized zone does not usually extend more than from 5 to 25 ft. below the surface. In the Southern States, where there was no Pleistocene glaciation, this zone extends to greater depths, and at Ducktown it is fairly uniform, and from 30 to 50 ft. deep.

The second important group of copper deposits is mainly, if not altogether of Mesozoic age, or else the earliest Tertiary. This group includes ten of the thirteen leading copper camps of the United States. In all of these the igneous rock associated with the ore deposits is diorite or the porphyritic equivalent, or a rock which is more acid. In at least eight of these camps, and probably in all of them, there has been con-



Fig. 10. Outcrop of Large Lode, Four Miles Northwest of Globe, Arizona.

(Photo., Ransome, U. S. G. S.)

d'Alene, Idaho, at Eureka, Nevada, and at Bingham, Utah, some silver-lead deposits were worked from open-cuts. Compared with the silver ores which are rich in arsenic and antimony minerals, the silver-lead deposits are less readily leached of their metal content, and for that reason the workable ore may be found nearer the surface. With respect to shoots of silver ore which do not outcrop, no generalizations can now be made. The leaching of these presents a wider range of possibilities, and, as a rule, no seemingly rational interpretations may be made.

Outcrops of copper deposits. The important copper deposits of the United States fall into two large groups. First, deposits in regionally metamorphosed rocks which are associated with granite-gneisses, diabase, actinolite, schists, and other basic rocks, or which occur as lenses in quartz-biotite schist, quartz schist, and related rock, and, second, deposits of Mesozoic age or early Tertiary, associated with monzonites, granites, their porphyries, and similar rocks. There are no middle or late Tertiary copper deposits in the United States comparable to the silver deposits of that age, just as there are no silver deposits comparable to the pre-Cambrian and Mesozoic gold and copper deposits.

The first group, which is in the main pre-Cambrian or Cambrian, includes the Lake Superior deposits, and the Appalachian deposits of pyritic copper ore, of which Ducktown is the most important example. Of these, two principal types may be recognized. They are (1), native copper in vesicular basalt or diabase; (2), schistose ores in regionally metamorphosed igneous or sedimentary rocks.

The native copper ore in pre-Cambrian conglomerate, basalt, or diabase, are not greatly leached at

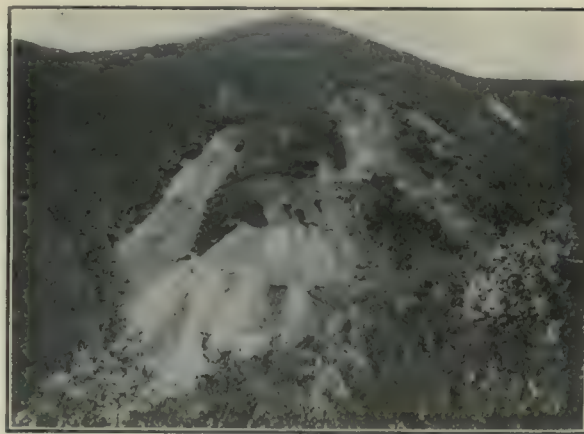


Fig. 11 Outcrop of and Workings in Copper Ore Disseminated in Porphyry, Bingham, Utah.

(Photo., Boutwell, U. S. G. S.)

tact-metamorphism, and the development of garnet zones in connection with the intrusion, but in few, if any, is the ore of the garnet-gangue of the first importance. Several types of these deposits may occur in one mining district. The most important classes are:

(1.) Garnet zones with sulphides intergrown with contact metamorphic silicates.

- (2.) Replacements of limestone.
- (3.) Fissures in granitic rocks.
- (4.) Disseminated chalcocite ores in monzonite porphyry.
- (5.) Chalcocite ores disseminated, and in sheeted zones in quartz-muscovite-biotite schist.

The garnet zones outcrop rather boldly as a rule. They alter to limonite, turgite, hematite, kaolin, and other minerals, forming a gossan not unlike a gossan of pyrite in some respects, but weathering is not so rapid. In these zones are often seen bunches of carbonate, oxide, or even sulphide copper ore, directly at the surface, though at some places there is leaching to a depth of 25 or even 50 ft. Not often is there leaching to greater depth. The bunches of rich oxidized ore which at some places are found in the outcrops of the garnet zones probably result from the oxidation of secondary chalcocite ore. Nearly everywhere the garnet zones are worked by open-cuts, a fact which illustrates the superficial character of their leaching.

Examples of garnet zones worked by open-cuts are several of the mines of the Clifton-Morenci group, described by Lindgren in his monograph on the district. Some copper deposits at Bullion, Nevada, also are stoped at the very surface. The Holland and other mines in the Patagonia district, Arizona, according to F. C. Schrader, belong also to this class, with which may be included the majority of garnet zones.

Replacements of limestone are so irregular in shape that no comprehensive statement can be made with respect to the depth of their oxidation. Many of them do not outcrop at all. The Copper Queen at Bisbee, which is the greatest mine of this group, outcropped only at one point and then was stoped at the surface. On the other hand, the tops of some other deposits at Bisbee and of other portions of the Copper Queen deposits are too low in grade to work, while the lower portions are bonanza chalcocite ore.

In regions of copper-rich magmas, and especially in zones of actively descending solutions, it would be poor prospecting to abandon a large limonite body in limestone at any depth short of several hundred feet, and not then unless the associated sulphides were known to be barren.

Fissure veins in deep-seated igneous rocks include the Butte and the Corbin deposits in Montana, and some scattered mines in other districts. If these veins are strongly fissured since the first filling (and the best of them are), then the copper is carried down 200 or even 400 ft. below the surface. This depth is greater also in areas of abundant groundwater, such as Butte, where of all copper lode camps of the United States the leached zone is greatest. The veins usually outcrop as iron-stained quartz, yellowish brown or red, or, when manganese is present, they are chocolate brown to black. Some are stained with copper carbonate, but they carry little copper at the surface, not much silver, and but a small amount of gold.

The disseminated copper ores in porphyry are perhaps the most important group of copper deposits. They are nearly everywhere of low grade, running from $1\frac{1}{2}$ to 3% copper, but they are so

large that they can be mined cheaply, and the mineral composition of the ores is such that they may be concentrated cheaply and with a fair saving. They are found at Bingham, Utah; Clifton, Arizona; and Ely, Nevada, and have been described by Lindgren, Boutwell, Lawson, Tolman, and others. At all of these camps they are inclosed in deep-seated intruding porphyries, the composition of which has a narrow range from a rather acid diorite to a rather calcic granite. At each of these camps the intruding porphyry broke through limestone, and in every case it had the power of inducing contact metamorphism. In all of these camps garnet zones with copper-bearing sulphides were developed in the limestone, and at every camp these have been rich enough to work, but, with the exception of the deposits in the Clifton-Morenci district, the value of the garnet zones is small compared with the deposits in the porphyry itself.

The porphyries which are responsible for these deposits were probably intruded in the same general period of vulcanism. At Clifton, Mr. Lindgren found that the intrusives cut the Pinkard formation, which is of Cretaceous age, and he regards the age of the intrusive as late Mesozoic or very early Tertiary. At the other camps Mesozoic or early Tertiary sedimentary rocks have not been found in contact with the porphyry, but from broad considerations it is highly probable that the ore-bearing magmas were intruded into the sedimentary rocks in the late Mesozoic, at the very beginning, during, or at the close of the Cretaceous. The deposits themselves show many points of similarity. All of them are formed in zones of fracturing, sheeting, or fissuring, but wide fissures are rarely developed. The country rock is always highly sericitized, but rarely or never contains carbonates. At all of the camps except Bingham the sericitization of the porphyry is so intense that great areas have been converted into a white monotonous rock that in hand specimens gives but little evidence of its true character. It is a difficult task to work out the genesis of these deposits, and it is only on their outer edges where the action has been less intense that their history is shown. Probably a small proportion of the original sulphides consolidated with the rock minerals from the molten magma, but most of the primary ore was formed just after the solidification and the shattering of the country rock, and the solutions were contributed by the still liquid portion of the eruptive below. This is shown by the character of the hydrothermal metamorphism. The ore was deposited in the fractured, shattered, and sheeted zones, and to some extent through replacement, the metals being deposited as sulphides along with the potash which was deposited as sericite. Workings in the ore-bearing monzonite at Bingham, Utah, are shown in Fig. 11.

At favorable places these orebodies have been fractured, sheeted, or fissured, and where this has taken place descending waters dissolving the upper portions of the orebody have deposited chalcocite ores lower down. Some of this chalcocite is massive, but a large part is merely in films on the primary low-grade pyrite and chalcopyrite. The depth to which such chalcocite enrichment descends is seldom

more than 600 ft. below the surface, and it often ceases before that depth is attained, but in exceptionally open rocks it may be deeper. The depth to the pay ore, which consists either of the chalcocite or of oxidized chalcocite (carbonates, oxides, and native metal) varies, but usually within rather narrow limits for a given district. At Bingham there is from 50 to 100 ft. of low-grade unworkable rock above the better ore. At Clifton this zone is, according to Lindgren, from 100 to 225 ft. deep. At Ely, according to Lawson, it reaches a maximum of 500 ft. The last figure is exceptional, however, and probably may be explained by unusual conditions.

The outcrop of these deposits is always strongly leached, and the sericitized feldspar is usually highly kaolinized by surface waters. In color some of the outcrops are almost white, but nearly everywhere they are stained with iron, and then their color varies from lemon yellow to reddish brown, or, in the more arid countries, to brownish black. Some stains of copper carbonate and copper oxides may be found at the surface, but at many places these are not present even over good deposits of chalcocite ore. The outcropping country rock is usually so highly altered that its constituent primary minerals are beyond recognition in hand specimens. As a rule, the dark minerals are removed entirely, but some biotite may remain where hydrothermal action has been less intense, and to some extent it may be dissolved by hot waters.

Briefly stated, then, it is warrantable to look for these deposits in deep-seated porphyries of Mesozoic age, in the acid diorites or still more acid rocks, and these are extensively developed in the central Cordilleran province, in Sonora, Arizona, Nevada, Utah, and in Idaho and Montana. They are to be sought in the silicious and especially in the potash-rich portion of the eruptives, or in the highly sericitized portion. They are in zones which suffered fracturing shortly after solidification, a large number of small fractures being the more favorable condition for extensive deposition. They are richest where shearing, fracturing, or shattering has taken place since mineralization, permitting a downward movement of water and the deposition of chalcocite. The outcrop is marked by iron-stained sericitized rock, seldom with conspicuous phenocrysts, varying in color from lemon yellow to a dark brown, and rarely showing much copper at the surface. They are of workable grade at depths varying from 15 to 250 ft., and the workable ore may extend downward to 500 or 700 ft. below the surface. They are in areas of copper-rich magmas, in areas of contact metamorphic copper ore, of copper-bearing fissure-veins, or replacement deposits in limestone. Although the most important, they are seldom the only type of deposit represented in the district.

The chalcocite ores disseminated and in sheeted zones in chlorite, biotite, muscovite schists are the last great group to be developed. All of the important deposits known of this class are found in Arizona and in the Pinal pre-Cambrian schist. They include the Miami deposits at Globe and the recently developed deposits at Ray, Arizona, the Ray Consolidated, Gila, and Ray Central. These schists which are

metamorphosed quartzitic sediments, according to F. L. Ransome,¹⁴ are abundantly exposed in the Pinal mountains, where they are cut by many intrusives of granite, diorite, and other eruptive rocks. At Globe the intrusion is so intimate that it is impractical to separate the schists from the eruptive rocks on a map of usual scale. According to Ransome, "the brecciation of the schists probably dates back to an early period. At that time the schist laminae were crumpled and broken, presumably under a slight superincumbent load, and the open or lenticular spaces were filled with quartz. The result was a fragile rock, full of small surfaces of weakness, that was thoroughly shattered by later movements." Some veins and zones of fault-breccia cut across the planes of schistosity, and the ore surrounds the breccia fragments, indicating that the mineralization is later than the regional metamorphism. The age of these deposits is probably Mesozoic. They may be contemporaneous with the disseminated ores in porphyries with which they seem to have many points in common. The Schultze granite, which may be responsible for the mineralization, is, according to Weed, Spurr, and Tolman,¹⁵ post-Paleozoic (Tertiary?) in age, and intrusive in the Pinal. The schist is impregnated with chalcopyrite, and contains numerous small veinlets of ore. The chalcopyrite is enriched by chalcocite. There is some leaching at the surface, but exact figures giving the depth of the leached zone are not now available. At Globe the oxidation in the schists is, according to Ransome, much more shallow than in the deposits in limestone, in quartzite, and in other rocks.

Change of state, from gas to liquid and solid, or the reverse, involves either an absorption or a liberation of energy. In most instances a change from one state to another is accompanied by a marked difference in mobility of the molecules of the substance. In such cases the energy absorbed or liberated is an appreciable quantity, often considerable; and when it is expressed, or measured, in units of heat the temperature at which the change takes place for given pressure is definitely determinable. But when there is no marked difference between one state and another, as when a solid upon increasing temperature passes through imperceptible gradations from a slightly plastic solid to an equally viscous liquid, there is no appreciable quantity of heat absorbed at any particular temperature, and consequently no definite melting point.

Heavy stamps have the following advantages over light ones, according to W. A. Caldecott: reduction of the initial capital expenditure in erecting, say, 200 stamps of 1750 lb. in place of 280 at 1250 lb. to do equal duty; reduction in size of mill-building, which varies almost directly with the number of stamps; reduction of power transmission equipment, which is nearly 30% less; and a lessening of labor cost, lubrication, and time losses, which also represents a difference of about 30% in the case cited.

¹⁴U. S. Geol. Surv., Professional Paper 12, p. 23.

¹⁵C. F. Tolman, Jr., MINING AND SCIENTIFIC PRESS, November 13.

STRIPPING A VEIN BY HYDRAULICKING.

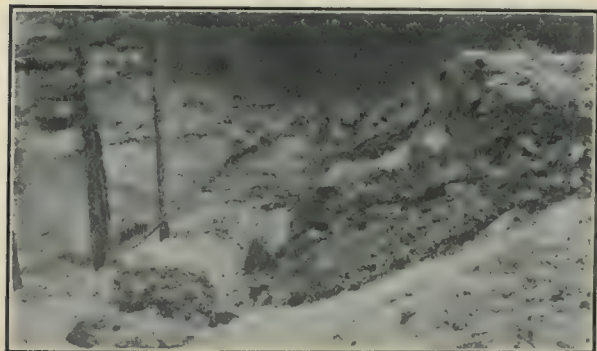
Written for the MINING AND SCIENTIFIC PRESS
By A. F. HUGHES.

An interesting method of uncovering ore has been devised and successfully used by the management of the Trinity Gold Mining & Reduction Co., at its properties near Carville, in Trinity county, California. With the hope that a description of the method and the conditions governing its application will be of benefit to others of the mining profession I have gathered the following data regarding it.



At Beginning of Operations. Looking West.

The ore is essentially a gossan, derived from a heavy iron sulphide, containing generally: Fe 29%, S 30, Si 18, and small percentages of Cu, ranging from 0.5 to 2. Only traces of Cu appear in the gossan, that metal probably having been leached out during the oxidation of the original sulphide. The orebody may be described as a replacement vein dipping at an angle of about 23° to the northwest, and lying between a hanging wall of slate, and a



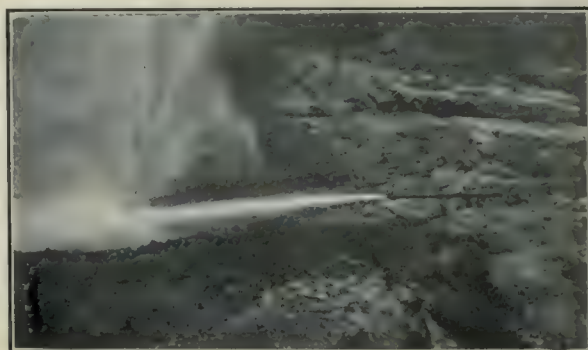
Ore Uncovered by Sluicing.

foot-wall of quartz-porphry. On account of the selective action of replacement, both walls are quite irregular, and the porphyry is often found as part of the hanging wall. After the primary orebody was formed there was a period of intense faulting and brecciation. The entire orebody, together with the adjacent country rock was cracked and broken. Both then being in a condition which permitted of easy percolation, began to be changed; the one by oxidation and the other by decomposition. The sulphide became cemented by its own product of decomposition. Hand specimens show, in fresh fractures, the forms of the original fragments. The soluble ingredients of the porphyry, especially of

that overlying the sulphide, were leached out, leaving the residual material in a soft and plastic condition.

From all obtainable sources, which included tunnels and cross-cuts under the ore, a number of shafts from the surface, raises through it, and an extensive exposure of croppings, the vein was estimated to have a perpendicular thickness between walls of 30 ft. or more, and to contain approximately 200,000 tons of millable ore. From the first it was evident that to make the venture a profitable one it would be necessary to exercise the utmost economy in mining the ore. Except for the presence of the hanging wall, varying in thickness from nothing up to 50 ft., mining could be carried on ideally by the open-cut method. To make that possible, and to prove more conclusively and quickly, the extent and continuity of the orebody, the management determined to strip the overburden by the use of a hydraulic giant, using 300 cu. ft. of water per minute, working under a head varying from 300 to 350 ft. The giant was supplied with a 2½-in. nozzle. The necessary water for this operation was easily available, since the company owns a water right, together with a ditch whose terminus is not over 700 ft. distant from the deposit.

The work was commenced near the croppings on



Uncovered Ore Below Stream; Overburden Beyond.

the west and carried on toward the rising ground to the east, where the overburden became thicker—up to nearly 50 ft. in places. At the beginning, trenches were cut by the stream along the dip of the deposit. It was found expedient to help the giant in making the bottom cuts, by blasting in lines radiating from the nozzle. It was never necessary to blast the bank, as it always caved when a good undercut was made. Generally from eight to ten 6-ft. holes, placed about seven feet apart, were fired at a time. The holes were all driven with augers, the softness of the porphyry permitting their use. The augers used were not of the common type of double-pointed bit, but were made after the pattern of a machinist's twist-drill tapered off at the striking end, and fitted with a loose cross handle. Two men worked with each auger; one turning and the other striking. While at times some fairly tough ground was found, it rarely took more than 20 minutes to drive a 6-ft. hole. While the holes were being driven the giant was used in keeping the loose dirt moving down the gulch.

During the three months when there was sufficient water for sluicing, it is estimated that 150,000 cu. yd. of overburden was removed at a cost not to ex-

ceed \$2800. This means that the work was done for about 1.3c. per ton of ore. It is true that the work was carried on under more favorable conditions than might obtain in other localities. Nevertheless, it seems to me that the above costs were low considering the work accomplished. Some of the conditions tending to simplify were: (1) The drainage area of the Trinity river does not come under the regulations of the California Débris Commission, which makes it possible to let the sluiced material take care of itself. (2) The fall from the workings to the Trinity river was more than sufficient to carry the material sluiced, even to the size of three inches in diameter. (3) The decomposed condition of the porphyry overburden simplified to a great degree the sluicing operation.

OZOKERITE IN UTAH.

Written for the MINING AND SCIENTIFIC PRESS
By H. W. MACFARREN.

Ozokerite may be characterized as a mineral wax or paraffin occurring in veins in the earth, usually in the vicinity of bituminous and petroleum deposits. It varies in color from brown to black, and has the appearance and consistence of wax, spermaceti, or paraffin. Analysis gives approximately 85% carbon and 15 hydrogen. Its specific gravity is 0.85 to 0.90, and its melting point 50 to 70°C. The fact that it is lighter than water and melts at a lower temperature than water volatilizes, plays an important part in the process of separating the wax from the rock gangue with which it occurs. While ozokerite can be put to practically all of the uses to which paraffin is applied, being essentially a paraffin, there are some uses for ozokerite for which there is no substitute, such as in the manufacture of certain kinds of shoe blacking and insulating material, and making phonographic records. It is refined into ceresin to be made into fine candles, ointments, pomades, floor wax, and similar objects, or to be used as a substitute for beeswax.

It is found in paying quantities in two localities only, in Galicia in Austria and in Utah in the United States. The Gallician deposits have been and still are the principal source of supply. The wax occurs there in oil-bearing sandstones, shales, and sandy clays of the Tertiary age, as stringers of wax along the stratification of irregular fissures. The ore is mined by lessees working small blocks of ground. After sorting out the waste, the ore is boiled in water in kettles, the wax rising to the top and being skimmed.

As a result of the lessening yield of this field, the price of high-grade crude ozokerite has risen in late years from 6 to 16c. per pound. Ozokerite is found in the vicinity of Soldier Summit and Colton, Utah, on the Denver & Rio Grande railroad, 120 miles south of Salt Lake. It is noteworthy that it occurs here under the same geologic conditions as in far away Galicia—in shales, shaly sandstones, and limestones of the Tertiary period, and contiguous to great deposits of carbons and hydrocarbons. The wax is not found in the strata to the same extent as in Galicia, but rather in vertical fissures that cut the

strata. These fissures form shear-zones, one wall of which is usually perfect, while the other is coarsely broken or brecciated. The wax is found as sheets or films between the walls and as stringers throughout the brecciated mass for a few feet away from the main fracture. It also occurs permeating the ground-up mass. These sheets are usually a fraction of an inch in thickness, but have been known to widen to form pockets of wax two or three feet across. In the museum of the California State Mining Bureau, Ferry Building, San Francisco, is a sheet of wax three-quarters of an inch in thickness that was taken from a Utah mine by me, which shows the characteristic occurrence of ozokerite. These mineralized fissures are generally of great length, and it is presumed of depth also, but uncertain as to width and percentage of wax. At the surface, or where the wax has been exposed, it tends to brittleness, but away from the surface, where it retains more of its volatile substances, it is soft and



Map of Utah.

flexible, and can be picked out and chewed like a paraffin chewing gum. There is a tendency for certain constituents of the wax to ooze out and stain the surrounding rock. This, together with the fact that the wax is approximately three times lighter in weight than the gangue or wall rock is liable to lead to erroneous conclusions as to the percentage of wax in the ore. All evidence tends to the conclusion that this ozokerite is the residual product of a petroleum, having a paraffin base, and was forced into these seams and fissures; the lighter hydrocarbons being subsequently volatilized, leaving the less volatile matter, or wax, behind. The same compound has been obtained from bituminous substances by destructive distillation.

The metallurgy of ozokerite as developed in Utah is simple. The ore is crushed in a breaker capable of crushing to one-quarter inch. Coal crushers and Sturtevant rotary crushers have been used. The

crushed ore is fed by a belt-driven plunger feeder of simple type to a tank of hot water in which the wax is melted from the gangue. The first tanks were constructed of steel, and steam jacketed. Later they were built of 3-in. wood planking at small cost. These tanks are 3 ft. deep, 14 in. wide, and 25 ft. long. In the bottom of the tank are placed two 12-in. screw conveyors, each 12 ft. long, operating as one screw, with stuffing boxes at each end, submerged centre-bearing, and driving mechanism outside one end of tank. A 2-in. pipe carrying exhaust steam for heating the water runs along each side of the tank just above the screw. The tank is filled with water and the steam turned through the pipes, rapidly bringing the temperature of the water to 170 to 190°F. The screw is started at the rate of six revolutions per minute, while the ore is fed in at one end of the tank. As the melting point of ozokerite is about 130°F., the wax at once commences to melt and rise to the surface of the water.

The success of the operation just described depends upon the wax being entirely liberated from the rock during the short period of its conveyance from one end of the tank to the other. Arriving at the farther end of the tank, the tailing is either lifted out by an inclined screw or drops into a cone attached to the end of the tank, from which it is discharged intermittently by a quick-acting valve operated by hand; the tailing being too coarse to admit of the continuous discharge used in cone devices for dewatering tailing.

The wax was at first skimmed from the top of the tank into pans. After cooling and hardening, the earthy impurities which had settled to the bottom were chiseled off, when the cake was sacked for shipping. It was soon found that the cakes were not acceptable to the buyers because of bad condition due to the moisture entangled in the wax. This led to the perfection of a continuous method of refining. The wax is drawn constantly from the melting tank to a small steam-jacketed cone tank acting on the principle of a water-clarifying cone, the settled impurities being drawn off from the bottom. Steam coils are used in this cone to assist in keeping the wax melted and to drive off the entangled moisture. The melted wax overflows the cone to pass about more steam coils to further reduce the contained moisture, finally flowing into pans in which it is cooled to form cakes that are satisfactory. The capacity of one of these melting and refining units is from 25 to 50 tons of ore per 24 hours. The amount of coal required to heat the water and wax is remarkably small, so that the whole process may be said to be both efficient and economical.

About five plants for extracting ozokerite have been erected in Utah, resulting in the production of several hundred tons of wax. None of these are now operating. The reason that more has not been done is simple—no extensive bodies of commercial ore have been found. It is impossible to say just what percentage of wax the present known bodies contain, but it can be understood that with ozokerite at 16c. per pound f.o.b. New York City, 2% wax would be valuable. Prospecting for ozokerite is being carried on in many localities.

SEVEN TROUGHS DISTRICT OF NEVADA.

By F. L. RANSOME.

*The Seven Troughs district, which is about 30 miles northwest of Lovelock, a flourishing town on the main line of the Southern Pacific railroad, lies on the east slope of a minor range designated on the Fortieth Parallel Survey map as the Pah-tson mountains, but now popularly known as the Seven Troughs mountains, but occasionally referred to also as the Stonehouse range. The higher parts of the mountains are dotted with junipers and the larger ravines contain small perennial streams. Grass flourishes on some slopes and for over 30 years the region has been used as a range for sheep and cattle.



Map of Nevada.

The watering places maintained in connection with this pastoral occupancy have given to the new mining district its name.

Supplies are hauled by teams from Lovelock. Passengers may reach the district most conveniently from the same point by the ordinary stage line or by automobiles, which meet the transcontinental trains and ply over a little better road than is used by horse-drawn vehicles. There are four little towns in the district, three of which, Vernon, Mazuma, and Farrell, are situated at the east base of the range. Vernon, the southernmost of the three, was the chief settlement in the district early in 1908, but had lost its pre-eminence by August of that year, most of the activity then centering about Mazuma, 2½ miles north-northeast of Vernon, and about Seven Troughs, which is 1¼ miles west-northwest of Mazuma, higher up the same canyon. Farrell, three or four miles

*Abstract from Bull. 414, U. S. Geol. Survey.

north of Mazuma, has at no time been as important as the other settlements.

The Seven Troughs mountains have a length of 24 miles and trend 20° east of north. The greatest width of the range is eight miles. Its crest culminates in a group of three summits. These attain altitudes of about 3000 ft. above the desert plains that surround the range on all sides but the north. The highest and middle summit is Granite peak. The one southwest of it, of schist, is designated Pahkeah peak on the Fortieth Parallel Survey map. A low broad pass, occupied according to this map by Miocene lake beds belonging to the Truckee formation, separates the north end of the Seven Troughs range from the longer Trinity range and from the Kamma mountains, a small group within which is the Rosebud mining district and the Rabbit Hole sulphur mine.

The known ore deposits of the Seven Troughs range are all in the Tertiary volcanic rocks, and consequently a small part only of the four days spent in the district could be devoted to the older formations. North of Mazuma the so-called Jurassic rocks appear first in Burnt canyon as a northeast-southwest belt of indurated clay slate about half a mile wide. This belt appears to correspond at this place to a low ridge, which, after having been completely buried under lava flows, has been uncovered again by erosion. The slate extends northeast and forms the rounded foothills just west of Farrell. It was found to be exposed westward along Stonehouse canyon nearly to its head. The dip varies and the slate is cut by dikes of a light-colored rock, presumably rhyolite. Near the head of the ravine the slate is intruded and metamorphosed by the 'younger granites', described by Hague and Emmons.

The intrusive granitic rock at the head of Stonehouse canyon is a fresh, medium-granular, rather dark gray rock, which evidently is not very quartzose and contains a large proportion of plagioclase. The microscope shows the rock to be a granodiorite.

The prevailing rock of the low, rounded hills on the edge of the Sage valley at Mazuma, and for a mile or more up Seven Troughs canyon is a pale reddish brown lava, much of which shows conspicuous flow lamination and a platy fracture. The rock is not a rhyolite but, pending chemical analysis, must provisionally be classed as a mica andesite, unusually poor in femic constituents. Much of it is a mica andesite vitrophyre. Associated with the mica andesite, which appears to occur in several thin flows, is at least one flow of vesicular basalt, some of which is exposed on the slope just north of the west end of Mazuma.

Directly under the vitrophyric andesite there is, as a rule, a flow of basalt. The thickness of this is not known but appears to vary greatly. Under this basalt and occupying the bottom of the Seven Troughs amphitheatre is a volcanic complex of rhyolite, basalt, mica andesite, tuffs, arkosic sandstones, and possibly other rocks of which the structural relations are as yet imperfectly known and which probably can be ascertained only by careful mapping and detailed microscopic work.

The most important group of mines is at Seven Troughs. Just southeast of the town, which lies on the south bank of the arroyo running down to Mazuma, are the Kindergarten and Wihuja mines, both on the same vein. The Kindergarten mine, owned by the Seven Troughs Kindergarten Mining Co., is developed by an adit and by an inclined shaft 280 ft. deep on the dip. A new vertical shaft, being sunk at the time of visit in August, 1908, was expected to cut the vein at a depth of about 300 ft. The Wihuja is a lease on the ground of the Seven Troughs Therien Gold Mining Co., and is opened by an inclined shaft to a vertical depth of about 212 ft. The Kindergarten and Wihuja workings are connected. Other leases on Therien ground, in operation but not productive in 1908, were the Bard and Jess (175 ft. deep), the Tyler, and the Sandifer leases. On the north side of the canyon, close to town, are the Mazuma Hills and Reagan mines, both productive. The Mazuma Hills mine is owned and operated by the Mazuma Hills Mining Co.; the Reagan is a lease on a vein lying east of the Mazuma Hills vein, but within the ground of that company. The Mazuma Hills mine is opened by a main adit 700 ft. long. Winzes from this adit connect with a level 100 ft. below and about 500 ft. long. There is also an upper disused adit about 100 ft. above the main level. The Reagan is worked through a shaft that was 165 ft. deep at the time of visit. Only the 65-ft. level, however, could then be examined, the bottom level being temporarily under water, pending the installation of pumps. South of the Mazuma Hills and Reagan mines is the Sandifer lease on Therien ground. Here, in the bottom of the canyon, a shaft is being sunk in expectation of finding ore in the southern parts of the Mazuma Hills and Reagan veins. North of the Reagan shaft, on the same fissure zone, are the Chadbourne and Bradley leases, whose shafts are respectively 135 and 165 ft. deep. Neither had been productive up to August, 1908. On the hillside a short distance above the mouth of the Mazuma Hills adit is the shaft of the Hayes-Mazuma lease. This was being sunk through rhyolite at the time of visit and was not in ore. Between the workings mentioned and the head of the ravine north of Seven Troughs are the Eclipse shaft, Providence adit, and various smaller unproductive openings made by lessees and prospectors. On the north side of Seven Troughs canyon, about a quarter of a mile below the town, is the adit of the Seven Troughs Tomboy Mining Co. This is a cross-cut running $N. 50^{\circ} E.$ At the time of visit it was 800 ft. long, and the intention of the company was to carry it 400 ft. farther. The adit first penetrates about 150 ft. of rhyolite and then goes through a seam of gouge into soft pyritized tuffaceous beds with a general low dip to the northeast. These are cut by many faults, probably of small throw, and contain some masses of basalt. About 350 ft. from the portal the adit goes through another seam of gouge into rhyolitic (or possibly andesitic) breccia cut by dikes of glass or obsidian. Lower down the canyon, near Mazuma, considerable tunneling has been done on the Badger group of claims. These workings were not examined. In Wildhorse canyon prospecting was in

progress in 1908 on the Wild Bull, North Pole, and other claims. The Wild Bull showed a little ore, but no shipments had been made. North of this canyon the only active prospecting appeared to be on the Snow Squall claim in Victor canyon, south of Farrell. It was reported that lessees had found good ore in sinking their shaft, but the workings were not visited. From the saddle south of Seven Troughs a long ravine runs south and then turns southeast, embouching at Vernon. In the upper part of this ravine is the Dixie Queen shaft 230 ft. deep and the Cleghorn Consolidated and Signal adits, from 200 to 300 ft. in length. Some lessees also were operating in 1908 on property of the Signal Peak Mining Co., high up on the ridge south of Seven Troughs, but owing to lack of time their shaft was not visited. About halfway down the canyon and about two miles south of Seven Troughs is the Fairview mine reported at the time of visit to be 650 ft. deep. This mine is known to have had some bunches of very rich ore in the upper levels and is said to have shipped about \$65,000. No stoping was in progress at the time of visit and the shaft was being sunk through hard basalt. The mine is owned by practically the same people that control the Kindergarten and Therien properties at Seven Troughs. In contrast to the attitude of other mine-owners in the district they showed disinclination to impart information and refused access to the Fairview mine. Adjoining the Fairview workings on the north is the Harris lease, on Fairview ground, with a shaft 185 ft. deep. The dump is basalt, much of it being vesicular. There were two mills in operation in the latter part of 1908, one belonging to the Kindergarten company and situated at Seven Troughs, the other belonging to the Mazuma Hills company and situated at Mazuma. Both are 10-stamp mills with amalgamating plates, Wilfleys, and vanners. No attempt is made to cyanide the tailing or save it.

Most of the dikes and fissures near Seven Troughs have a nearly north-south trend. The veins as a whole consist of soft crushed material and do not outcrop above the surface. They represent zones of brecciation or of small fissures, along which movement has continued since the spaces originally formed were filled with quartz. Consequently the typical quartz of the district is friable or sugary, and generally contains or is mingled with many fragments of shattered rock. Clear solid masses of quartz, even of small size, are rare. The veins on the whole are rather narrow, ranging from a few inches up to about two feet in width. It is possible, however, that the average working width may be considerably increased when the district has better facilities for handling and treating ore.

The valuable constituent of the lodes is native gold containing a considerable proportion of silver, and consequently of a rather pale color. In most of the rich ore the gold is visible either as clusters of small irregular particles or as coarse crystalline aggregates. No complete well formed crystals were seen, but there is a noticeable tendency of the coarser gold to form crystal facets. The Mazuma Hills, Reagan, and Fairview mines have afforded some very showy specimens of bright yellow gold interlamin-

ated with firm quartz or enveloping fragments of altered country rock. Loose nugget-like masses up to an ounce in weight have been found in soft crushed vein matter in the Reagan lease. The rich bunches of gold are not uniformly distributed through the veins, and it is difficult in some cases to secure clean sorting. It was found, for example, that material thrown over the Reagan dump as waste or as low-grade ore to be treated later carried small quartz stringers, and that some of these, when broken across, contained coarse native gold.

The tenor of the ores, as is to be expected, has a wide range. A mill run from the Reagan lease in August, 1908, averaged about \$130 per ton. Picked ore from the Fairview, Mazuma Hills, and Reagan mines has yielded at the rate of several thousand dollars per ton. In the Kindergarten mine the ratio of gold to silver by weight is said to vary from 1:2 to 1:3 near the surface, but at the bottom of the mine to be nearly 1:1. Assay certificates of rich ore from the Reagan lease, seen in Seven Troughs, showed a ratio of nearly 2 of gold to 1 of silver. At one place on the lower level of the Mazuma Hills mine quartz carrying a little chalcopyrite is reported to have yielded on assay 200 oz. of silver and 0.3 oz. of gold per ton.

The three important veins near Seven Troughs are the Mazuma Hills, Reagan, and Kindergarten veins. The first two, known only on the north side of the canyon, strike about N. 10° E. and dip from 60 to 65° W. The Reagan vein lies about 40 ft. east of the Mazuma Hills vein. The Kindergarten vein, on the south side of the canyon, strikes N. 63° E. and dips south. The dip varies from 60° near the surface to 22° on some parts of the 40-ft. level. The dip at the bottom level is about 35° (vertical depth 212 ft.). The stope length of the ore-shoot is about 130 ft., and the average workable width of ore is probably about 2. At the northeast end of the mine the vein appears to be cut off by a zone of north-south fissures in which no ore had been found at the time of visit.

The country rock varies from place to place in each mine. The Kindergarten and Wihuja workings, as seen in 1908, are mainly in basalt. Part of this is a soft altered amygdaloidal variety, evidently an extrusive rock. Other parts are a dense olivinitic variety that apparently cuts the amygdaloidal flow rock. Masses of soft light-colored rock, either rhyolite or mica andesite, but too decomposed as a rule for satisfactory determination, occur at unexpected places on both sides of the vein. They probably represent intrusions somewhat displaced by faulting.

The Mazuma Hills vein follows a basalt dike that varies in width from a fraction of an inch to more than 6 ft. The general country rock is a nearly white altered rock that the microscope shows to have been originally a highly glassy rhyolitic tuff or flow breccia. It is now devitrified into a fine-grained, obscurely crystalline aggregate and contains minute disseminated crystals of pyrite. The best ore is on the foot-wall or east side of the dike, and appears to be for the most part minutely fissured and silicified rhyolite tuff; but some ore extends into the basalt. At one place there is a second vein, about 10

ft. east of the main fissure zone and with a little lower dip. The horse of rhyolite tuff between the two is said to be all low-grade ore. Some of the best ore in the mine is reported to occur as small gold-bearing stringers traversing hard rhyolitic tuff.

The Reagan vein also follows a basaltic dike and shows considerable resemblance to the Mazuma Hills vein. The general country rock, however, is more varied. Much of it is a highly altered volcanic glass, apparently basaltic, which, owing to its originally brittle character, has been elaborately and minutely cracked and fissured. Many of the cracks are microscopic and have a perlitic arrangement. This rock is generally greenish gray, and much of it is so fine-grained that its mineralogical character can not be ascertained under the microscope. Other varieties show a few microscopic phenocrysts of plagioclase, partly altered to calcite, and a groundmass in which traces of an original microlitic texture can be detected. Much of the rich ore of the Reagan lease consists of this altered basaltic glass, in which the irregular cracks have been filled with quartz carrying free gold. The secondary minerals identified in the glass itself are pyrite, quartz, calcite, and apparently a little chlorite. Calcite is not abundant, which is rather surprising in view of the calcic composition of basalt. In some places altered glass of the kind described passes into a highly amygdaloidal variety that is well exposed in an adit on the Sandifer lease just south of the Reagan mine and in the Bradley lease to the north. In the Sandifer lease the vesicles are only partly filled by clear projecting crystals of quartz. In the Bradley lease some are filled with quartz and some with calcite. Pyrite is disseminated through the light greenish gray altered substance of both varieties, and a few vesicles were noted that were first lined with pyrite and then filled with quartz. Although pyrite is fairly abundant throughout the altered basaltic and tuffaceous rocks near the ores, and occurs with quartz in very small, almost microscopic veinlets, it appears to be rare in the generally larger veinlets in which are the visible particles of gold. These veinlets, so far as could be seen in 1908, contain little or no pyrite. According to D. H. Skea, some proustite and possibly some stephanite or polybasite were found with the gold in the Fairview mine, and a little chalcopyrite and specks of a gray mineral resembling bornite were noted in 1908 on the bottom level of the Mazuma Hills mine in quartz similar to that elsewhere rich in gold; but as a rule the auriferous quartz is notably free from any other mineral than gold. Stibnite occurs in friable lenticular masses of considerable size in soft crushed basalt in the Chadbourne lease, and is said to have been found also in the Reagan lease. It does not, however, appear to have any intimate connection with rich ore. A little native silver is said to have been panned from the ore of the Wild Bull mine in Wildhorse canyon.

All of the ore visible in 1908 was within the range of oxidation. The results of weathering, however, owing to the very small quantity of pyrite in the veinlets, are not conspicuous, and there appears to be no very definite change from oxidized to sulphide ores. Pyrite and stibnite, as has been seen, both oc-

cur in connection with the ore deposits above the ground-water level. The surface of the underground water near Seven Troughs corresponds approximately to the bottom of the canyon, in which is some running water, and doubtless rises a little higher in the adjacent ridges. In August, 1908, water was just making its appearance in the bottom of the Kindergarten mine at a depth of 212 ft., and the lessees of the Reagan, 165 ft. deep, were putting in a pump in order to work their lower level.

Not enough mining or geologic work has been done to enable anyone to pass final judgment on the future of the Seven Troughs district. The presence of very rich, easily treated gold-silver ore in fair abundance at several places within an area some six miles in length is highly encouraging. On the other hand, it should be noted that the veins are not of great size and apparently are not as a rule of great length or persistence, and their character at any considerable depth below possible superficial enrichment is yet undetermined. Moreover, it is evident that in most of the mines the country rock may be expected to differ at various depths, and it is yet to be proved that the rocks beneath the tuffs and basalt in which most of the known ore occurs will be equally productive. In short, while the district is a most promising one for prospecting and developing, it is yet too early to regard it as one certain to yield largely for a period of many years.

The Prospector.

This department makes a charge of 25 cents to subscribers not in arrears and \$3 to non-subscribers for each determination. To ensure promptness in publication of the determinations, payment must be forwarded with specimens.

F. P. S., Robinson, Utah: Altered dioritic rock.

W. H. S., Lundy, California: Limonite with quartz.

R. J. H., Agua Salada, Mexico: No. 1 and 2 are altered gabbroitic rock.

D. A. H., Telluride, Colorado: The black specimen is obsidian and the white rock is quartz porphyry.

E. S., Michoacan, Mexico: No. 1, basalt; No. 2, andesite; No. 3, andesite; No. 4, andesite; No. 5, porphyrite; No. 6, metamorphosed volcanic; No. 7, jasper.

E. C. M., Mazuma, Nevada: No. 1, clay with pyrite crystals; No. 2, chloritic mass with pyrite; No. 3, chlorite and calcite; No. 4, silicious limestone with pyrite.

Zinc ferrocyanide, according to Rupp, may be determined as follows: the Zn solution is made as neutral as possible and Rochelle salt added. It is then mixed with a known volume of ferrocyanide solution, diluted to 50 or 100 c.c., and allowed to stand about $\frac{1}{2}$ hr. for the formation of the denser $K_2Zn_3(FeCy_6)_2$. Then an excess of N/10 I solution (measured) is stirred in, and the mixture allowed to stand for 1 hr., when it is titrated with $Na_2S_2O_3$. Ferriecyanide results from the action of the I on the K_2FeCy_6 . 1 c.c. N/10 I = 0.00981 Zn.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

Theory of Volcanic Action and Ore Deposition.

The Editor:

Sir—In a recent paper read before the members of the Institution of Mining & Metallurgy, in London, Hiram W. Hixon advances a new and interesting theory of volcanic action and ore deposition. The basis of this theory is that the earth was at one time an incandescent sun, with a temperature above the critical temperature of all the matter composing it. Dalton showed that gases of different densities, if allowed to mix, would form, in time, a uniform gaseous mixture. Hence it follows that each gas entering into the composition of such a sun would diffuse throughout the whole planet, even though its density at the centre were greater than the density of the corresponding solid. Considering for the moment that the present condition of the earth is derived from the gaseous state mentioned, Mr. Hixon maintains that it differs therefrom only through the pressure of a crust imprisoning the gases and exerting great pressure upon them.

It is said that a rigidity equal to that of a sphere of steel would be required to resist the tidal action. The question immediately arises as to the limit of rigidity to which gases under pressure may attain. Rigidity is a property of solids acquired by the reduction of the amplitude of vibration of their molecules with relation to each other. If by pressure upon a gas, existing at a temperature above its critical temperature, the amplitude of its molecular vibrations be made less than in the corresponding solid, its density must be greater.

It is known that there is an increase in temperature of approximately 1°C. for each 100 ft. of depth. This places the zone of critical temperature about one hundred miles below the surface, and it means that all matter from the limits of this zone to the centre of the earth is in a gaseous state. Through secular cooling the outer surface of this zone is reduced below the critical temperature of a part of some of the elemental or combined gases diffused through it. Since pressure will raise the melting point of a solid, enough pressure will raise it to the critical temperature; and the solid will pass directly to the gaseous state, or vice versa, without becoming a liquid. The gases will pass, then, to the solid state, and expand in so doing, it being assumed that the pressure has given the gas a greater density than the corresponding solid. Thus would result an addition of matter of high critical temperature to the flowage zone of the solid crust. The gases of low critical temperature would saturate the flowage zone and segregate at its outer rim, or just beneath the zone of fracture. Here they would accumulate until super-saturation of the periphery of the flowage zone resulted and sufficient elastic force to rupture the zone of fracture had accrued. In escaping through

the zone of fracture, these gases of low critical temperature give rise to the phenomena of volcanic action, earthquakes, elevations, intrusion of dikes and laccoliths, faulting and folding, accumulation of hydro-carbons, and ore deposition. The above theory leads to some interesting deductions, and explains much that has hitherto caused wide differences in opinion.

THORINGTON CHASE.

Concepción del Oro, Mexico, November 21.

The Qualified Mining Engineer.

The Editor:

Sir—Some hold that only the man who has had a university training and can write E. M. after his name has a right to the title of mining engineer. I would suggest that the only degree which a university should grant to a young fellow after three or four years study, should be that of Q. S. M. or Qualified Student of Mining, or possibly A. E. M., Associate Engineer of Mines; never E. M. In my opinion a mining engineer is a man qualified to solve the problems of mining, without regard to how, when, or where he acquired the knowledge. A university student is no more qualified than a junior lieutenant is to be general. An engineering course at a university does not by any means guarantee that a young fellow will ever become a mining engineer. It only gives him a good start. In practical life mining might even be distasteful to him. An engineer, especially a mining engineer, is first born, then discovers that he has the instinct, and is finally molded by circumstances, and proved by his results. I believe that the older men of the profession will endorse this; but what the public and the investor want to know is how to judge an engineer and whom to trust. The routine of another branch of the profession, marine engineering, might be copied.

In the mine the safety of the lives of hundreds of men, and the security of vast investments is just as dependent upon the engineer as in the case of a ship at sea. Why then should not the title of Mining Engineer be given only after examination? Mining is the life of every new country, and everything that can be done to stimulate the industry and to train the rising generation to higher efficiency is of economic value to the nation. To insure that the men directing mines are properly qualified would be the first and most certain method of increasing the wealth resulting from mining and of giving guarantee to the investor. The best means of doing this and of solving the question, who is a Mining Engineer, would be to bring the various universities and schools of mines and the Geological Survey into relationship with a strong Federal Department of Mines. A competent board of examiners should be appointed with powers to confer progressive degrees, titles, and licenses; the routine being more or less as follows: Any person who desires to enter the profession should register as an S. M., that is a Student of Mining. If he enters any school of mines or university and goes through the regular course he might receive the degree of A. E. M., Associate Engineer of Mines, subject to examination. If the individual is actually employed at mining or other work, and is gaining

his theoretical knowledge by self-instruction, he might come before the examiners, and on passing a simple examination covering the elements of mining engineering he should be given the title of Q. S. M., Qualified Student of Mining. Then if after working underground in various capacities and proving one year's practical experience, he should be eligible for the examination for mine foreman, and on passing that for third or second-class certificate. First-class certificates would only be granted to old and experienced hands. The same routine might apply also to the title of mill superintendent, underground surveyor, mine mechanic, assayer, and metallurgist. Six months practical experience should be required in each case.

As soon as a mining man could show certificates of all of the above qualifications, with the exception that he need not present both a mill superintendent's certificate and a smelter superintendent's certificate, he should be eligible for examination as 'mine superintendent', and by passing could obtain a third-class certificate if he had three years' practical experience. Second, first, and chief's certificates should be granted only after two years' further experience in each grade, and subject to more rigorous examinations.

Certificates should also be given on examination, and with proof of at least six months' practical experience, in each of the following: field geology and mineralogy; economic geology; topographic surveying; the elements of road building and tramway construction; hydraulic engineering, including some knowledge of hydro-electric power-plant work. This would give a total of at least two years field work. With a third-class superintendent's certificate, which with the above field-work certificates would give a total of five years' practical experience, a man should be eligible for the examination of Engineer of Mines and could obtain either a fourth, third, or second-class certificate, according to his proof of capacity at the examinations. A first-class or Chief Engineer's certificate should only be granted after at least two years further experience as manager of some mine and another examination.

The above, of course, only outlines a rough scheme. I do not propose competitive examinations, nor anything complex or difficult; only sufficient to show general proficiency and reliability. Neither would I propose that this be made compulsory, except in the case of men employed at large mines, and especially at coal mines. I think that many examinations having reference to minor posts, and specialists' branches of work, might be held, and certificates granted. Licenses should be compulsory wherever men are controlling work in which human life is in danger, such as coal miners, smelter-bosses, hoisting-engineers, foremen, timbermen, and men in charge of explosives and ventilation.

If such a system were to be established, for the first two years the examinations might be made simple, and facilities granted to engineers already actively engaged in the profession to easily obtain their certificates. The examinations should be open to all classes and to all nationalities. After a few years, as the system developed and experience was

gained, the examinations could be made more severe, and the practical experience required more thorough.

In addition to this the Department of Mines should issue an official monthly bulletin, in which the mining statistics, and the results of official investigations, tests, and experiments would be published, giving data that would be of practical assistance to mining men. Surely mining deserves some such recognition as is given to Agriculture and Forestry.

JOHN M. NICOL.

Mexico, November 22.

Modern Quicksilver Reduction.

The Editor:

Sir—In your issue of November 20, H. W. Turner questions the correctness of Mr. Strauss' statement as to the amount of quicksilver recovered from soot. In reply I beg to state that formerly when handling ore over 1% in value at New Almaden, more quicksilver was obtained direct from the condensers, but at present the saving is dependent on a number of conditions: (1) The character of the ore. (2) The grade of the ore. (3) The kind of fuel, whether wood or oil, and in regard to the latter whether steam or air is used in injecting the oil.

When treating a clayey ore, such as we have at New Almaden, a certain amount of fine material is carried over to the condensers, and when this comes in contact with the steam (as we use fuel oil injected by steam), it forms a sticky muddy soot, which tends to hold the quicksilver mechanically as long as it is wet, and as long as it stays in the condensers it stays wet. When a high-grade ore of 1% or over is treated, the percentage of mercurial vapor in proportion to other gases is greater and the tendency is to condense closer to the furnaces than where a lower grade ore of, say, 0.2 to 0.3%, such as is now being treated.

In the first case mentioned the soot becomes surcharged with mercury and some of it runs out of the condensers, nearest to the furnace, while in the second case it is carried farther back from the furnace, and in consequence the soot in the condensers close to the furnace is lower in grade and little, if any, runs out of the soot and practically all is recovered from the soot. In our case per 100 flasks produced we seldom get over three or four out of the condensers on ore of 0.2 to 0.3% grade. (3) With wood a dryer soot is found (even though a larger quantity), and consequently more quicksilver tends to run out of the soot than with oil injected by steam. What the result would be if the oil were injected by compressed air I am not in position to state, but would like to hear from other correspondents.

ARTHUR FEUST.

New Almaden, California, November 22.

[Mr. Turner's note in regard to the relative amount of mercury obtained from soot, was intended to call attention to the usual results and not to any special case. In 1882, the total production of quicksilver at New Almaden was 28,070 flasks, of which only 1122 were obtained from soot, or only 4 per cent, according to S. B. Christy.*—EDITOR.]

*Trans. Am. Inst. Min Eng., Vol. XIII, p. 582.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

A lease granting the right to extract ore from a certain named level of a mine includes the right of extraction to the next level above.

The recent mining act of California does not affect nor abolish any mining district or the rules and regulations thereof.

The number of locations within a group upon or outside of which the annual expenditure may be made is immaterial except in the case of petroleum oil placer claims. In the latter case the locations within such group must not exceed five.

Gas producers consist essentially of vertical cylinders of from 8 to 12 ft. diam. and 10 to 15 ft. high lined with fire-brick. At the bottom is a grate on which is supported a mass of fuel 6 to 7 ft. deep. From the top of the producer a duct leads to the main gas-flue and at the base are openings for the admission of steam and air under blast.

'Cost book' is a term employed in the tin mines of Devon and Cornwall, recognized also by the so-called Stannaries Act, that includes all books and papers relating to the mine which for the time being are kept by the 'purser', or, in the absence of such an official, by the secretary. The last Stannaries Act, passed by the Parliament in 1869, was repealed by the Statute Law Revision Act of 1893.

Fuel value is stated in English and American engineering literature in terms of b. t. u. (British thermal units). The simplest formula for calculation is the modified Mahler, which is

$$20050 C + 67500 H - 5400 = \text{b. t. u.}$$

In this formula C=the carbon present by weight, and H=the hydrogen; both expressed decimally as to the total weight of the fuel.

Strength of pine increases rapidly with the number of rings of annual growth per inch, reaching a maximum between 8 and 10 rings, and then falling off slightly as a rule. Strength also increases with the weight of the timber, the greatest weight being found in moderately old trees. The strength of sap-wood depends upon the period of growth when it was formed. In large-sized trees the sap-wood is weak; on the other hand, in comparatively young trees the sap-wood is heavy and strong.

Pitch-blende may be detected by the following properties: Color, pitch black, velvety black, brownish sometimes with a grayish or greenish cast. The streak on rough porcelain, that is, the edge of a broken plate, is brownish black, olive green, or grayish. Lustre, dull, metallic, greasy, pitchlike. Fracture, conchoidal, that is, with smooth curved surfaces, to uneven; brittle. Hardness, less than quartz. It is not scratched by a knifeblade unless weathered. Specific gravity, heavier than iron or steel; also heavier than galena.

The Welsh process consists in treating copper ore, sulphide and oxide as well as silicious, by a series of roastings and fusions to raise the grade finally to blister. This is subsequently refined. The process possesses the advantage that a variety of ores, both coarse and fine, may be treated in a few reverberatory furnaces without large investment in plant. For a small tonnage, it is possible to produce metallic copper on the spot. The process includes five operations: (1) calcining the ore; (2) fusion; (3) calcining coarse metal; (4) second reverberatory fusion; (5) 'roasting' and formation of blister copper.

Tungsten is of wide occurrence, but the individual deposits can hardly be said to be large. As a rule they are 'pockety'—that is, they occur in lenticular masses or small shoots. Many of those at the surface are quickly and easily mined, but it may then take all the profits derived from the first orebody to find another one. The tungsten minerals used as ores are hübnerite, a tungstate of manganese; wulframite, a tungstate of manganese and iron; ferberite, a tungstate of iron; and scheelite, a tungstate of calcium. They generally occur in veins cutting igneous rocks that contain much silica, such as granite and granodiorite.

Losses in electrical generators may be determined as a speed function by using what is known as a deceleration curve. With the water shut off from the turbine the machine is brought up to speed by interconnecting the generators on two wheels, one of which can take water, bringing them up to more than their running speed, and then cutting loose that wheel in which the electrical generator losses are to be determined. Knowing the moment of inertia of the rotating parts, which can be readily calculated, observing the negative time-differential of the speed, and multiplying by the moment of inertia, the power-losses can be readily plotted as a time-function. Another way is by an electrical braking device; the simple connection of the electrical generator through a known resistance and measuring the current carried by it will show what the power usefully generated does in the braking of the machine.

Churn-drills are applicable to prospecting only of comparatively shallow deposits of large volume. They have an advantage over the diamond-drill in exposing a larger cross-section and in applicability to loose material. The doubt which usually obtains as to the exact horizon from which the sample comes, and the finely ground state of the material makes them of small value in testing narrow high-grade veins. They have proved widely useful in prospecting alluvial deposits and the porphyry coppers and in drilling through barren cover preparatory to testing iron ore horizons with the more expensive diamond-drill. Churn-drills are used altogether in exploration in the Joplin and Wisconsin zinc regions where the ground is much fractured and flinty. In the disseminated lead region of southeastern Missouri the diamond-drill is preferred. The firmer ground, and greater freedom from flint makes its use possible.

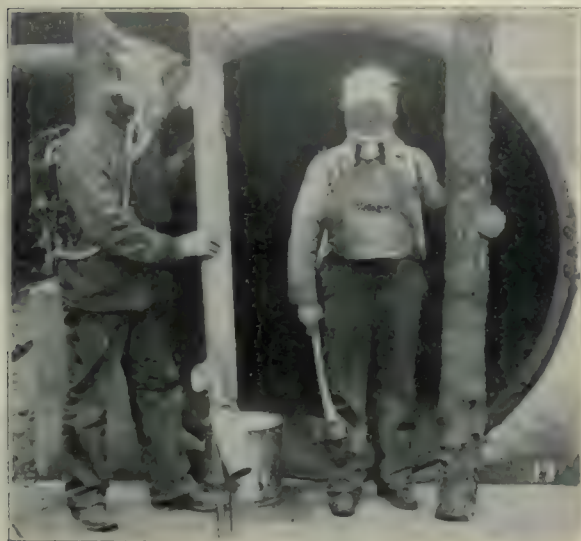
Special Correspondence.

WASHINGTON.

Coal Mine Accidents. — Oil Land Withdrawals. — Proposed Leasing System.

As a part of the campaign of the United States Geological Survey to reduce the number of fatalities in coal mines, officers of the Technologic Branch have been addressing the miners of Pennsylvania and Tennessee. J. A. Holmes has just completed a series of talks to the miners of the anthracite region on the use of explosives, detailing the results of the tests at the Pittsburg experiment station. Col. Dunn, U. S. A. chief of the Bureau for the Safe Transportation of Explosives, and C. E. Munroe, of George Washington University, also addressed the miners. H. M. Wilson, chief engineer, Technologic branch; J. C. Roberts, assistant chief engineer, and A. C. Ramsey, mining engineer, addressed the miners and operators in Tennessee. The German Government recently sent a commission into Belgium to study the methods employed in the coal mines of that country in combatting explosions caused by fire-damp. Such explosions were apparently for a long time unknown in German mines, but now on account of the increasing depths of the mines operated the dangers are beginning to be more keenly realized.

In connection with the recent withdrawal from entry of



Rescue Corps at Government Testing Station, Pittsburg.

over 3,000,000 acres of public petroleum lands in California, Wyoming, Utah, and Oregon, the following statement is given out by C. W. Hayes, chief geologist of the United States Geological Survey. "To remedy the present unsatisfactory conditions by which public oil lands have to be entered under a law framed primarily to provide for placer gold mining entries, it is generally admitted that a radical revision of the American mining law is necessary. Anticipating that Congress will recognize and meet this need, the Secretary of the Interior has withdrawn from all forms of entry all vacant public lands designated by the Geological Survey as probably containing oil and gas. This Executive action is, however, only temporary and is intended to preserve the *status quo* until Congress acts. When the present placer mining law was enacted, probably no one had any idea that it would ever be made to cover mineral deposits so far removed in every essential characteristic from gold-bearing gravels as are oil and gas. When oil was found on the public lands no other law was on the statute books under which title to it could be acquired, and this anomalous and wholly unsatisfactory condition still holds, to the great detriment both of the Government and of the oil industry. The fundamental basis of a location under the placer law is discovery, and the courts have held uniformly that there can be no legal location until there has been a discovery. But in the

nature of the case there can be no discovery of oil until a well has been drilled at great expense. Since ordinarily there are no surface indications of the oil, the well must be drilled upon purely geological inference. It follows, therefore, that the driller is wholly unprotected against rival claimants to the land until he has completed his first well, or he is forced to make a false claim to discovery on which to base his location. One common method of evading the law is to locate oil under the guise of a gypsum claim. In many of the California oilfields the surface soil contains a small amount of gypsum, although rarely in sufficient quantity or purity to be profitably mined, even if favorably located for transportation and market. It affords a pretext, however, for a location under the placer law, and large numbers of claims have been patented where it is a matter of common knowledge that the real object is to acquire title to the oil. In this way land worth thousands of dollars per acre has been acquired from the Government for \$2.50 per acre, and this without oil development. Moreover, it is not generally the man of small means, but rather the wealthy corporation that resorts to this subterfuge to secure title. Although many of the oilfields in the public land States, and particularly those in California, are in regions wholly devoid of agricultural possibilities, no sooner is a successful well drilled than the entire district is covered by homestead and scrip entries, the purpose of which is to secure title to the oil under cover of the agricultural land laws. It is to meet these conditions that a thorough revision of the law is needed.

"Any law which will adequately meet the requirements of the case must recognize the fundamental difference between oil and gas and other minerals, namely, mobility. These elusive products can be drawn from a distance underground across boundary lines, and exclusive title to the product is acquired only after it reaches the surface. It follows, therefore, that oil can be disposed of by the Government or other owner of the land in which it occurs only as a commodity, and not in terms of acres like coal or other minerals occupying fixed locations. This difference is so well recognized that it has determined the leasing system which is practically universal in all the oilfields where the land is in private ownership. The Government cannot do better than to adopt the plan which has been worked out through long experience, and, where the holdings are sufficiently large, has been found thoroughly satisfactory, both to the oil operator and to the private land owner. Why should not the Government as a land owner deal directly with the producer rather than through the intervention of a middleman to whom title to the land has passed? Any ideal or practical law must further recognize the fact that actual discovery involves heavy expenditure and considerable time, and that the prospector must be adequately protected in his investment before as well as after the discovery is made. The area to which he is given a preferred right must therefore be sufficiently large to justify his initial heavy investment and in such compact shape as to protect his discovery from encroachment by drilling on subsequent entries. A well considered leasing law will give certain incidental advantages of great importance both to the Government and to the oil operator. It will constitute the most effective means for the conservation of the oil and gas resources of the country by enabling the Government to regulate developments so as to prevent much of the criminal waste now prevalent.

"Under the present system the owner of a 20-acre placer claim is compelled to drill and pump the oil from his land with all possible speed, regardless of transportation facilities or market, for otherwise his competitors on adjoining claims will take a large share of it away from him. In the resulting feverish exploitation half a dozen or more wells may be drilled when one would have secured the same amount of oil, a serious economic waste to the Nation and a heavy tax on the ultimate consumer. Also, unrestricted drilling by careless or ignorant operators may ruin a valuable field by admitting water to the oil-sand from a higher or lower water-bearing stratum. Many examples of criminal waste resulting from the unrestricted exploitation of oilfields might be cited. The Government is not only the largest owner of oil lands, but it is likely to be the largest con-

sumer. The six largest battleships in commission or under construction in the American Navy are equipped for the use of either oil or coal, and the fourteen largest destroyers use oil exclusively. The question of fuel supply for these vessels is certain to become an exceedingly important one in the near future, and the law should provide a means of perpetuating a supply for this certain future need. The fact is gaining recognition that the natural resources remaining in the possession of the Government are the heritage of the whole people, and the idea that they should be economically utilized for the general good rather than exploited for the enrichment of a few individuals is rapidly crystallizing into public opinion. The enactment by Congress of a law providing for the leasing of oil lands will be a logical and much needed action in the Government's management of its great petroleum property."

Bituminous coal operators representing that industry in Ohio, Pennsylvania, Kentucky, Indiana, Illinois, and West Virginia, called upon the President, November 24, and requested that the railroads of the United States be permitted to pool freight under supervision of the Government. They declare that at the present time and for some time past operators of the different districts have been furnished with only 40 to 48% of the cars needed to move their coal and that they are losing millions of dollars through the delays. This, they said, could be avoided were other roads having idle cars permitted to come in and help move the coal. Mr. Taft was urged to make plain in his coming message the necessity of taking immediate action against the car shortages and freight congestions. The members of the committee who met the President were Samuel A. Taylor, representing the Pittsburgh District Coal Operators; T. K. Maher, of the Pittsburgh Vein Coal Operators Association, of Eastern Ohio; and Howard Mannington, of Columbus, Ohio, representing the Ohio Coal Operators' Association. Tom L. Lewis, president of the United Mine Workers, was also present at the conference. The President promised to give considerable thought to the request of the coal men. W. H. Thompson, editor of the *Daily News Miner*, Fairbanks, Alaska, is in Washington waiting for Congress to begin, when he will present a proposition for Alaska to have a more representative government. Mr. Thompson says Alaska is growing so rapidly that a Territorial governor and four Federal judges are not sufficient to take care of his country. He thinks Alaska is big enough for a territorial legislature.

LONDON.

Consolidated Gold Fields.—Simmer & Jack.—French Rand.

The Consolidated Gold Fields of South Africa depends nowadays for its profits almost entirely on the yield of gold by its subsidiaries rather than on the sale of properties. For many years Simmer & Jack was its chief producer, and within the last two or three years the output of other subsidiaries, namely Robinson Deep, Simmer East, and Knights Deep, has become important. The financing of new propositions in other countries is now more profitable. Rhodesia, West Africa, Russia, the United States, and South America receive attention from this company. To give some idea of the extent of the Gold Fields' operations on the Rand, I may mention that the subsidiary companies Simmer & Jack, Robinson Deep, Knights Deep, Simmer East, Jupiter, Simmer Deep, and Nigel Deep employ 1350 stamps and during the year ended August 31 produced 984,302 oz. of gold. The total stamps in operation on the Rand are 9842 and the yearly production 7,360,915 oz. The Gold Fields group employed 24 tube-mills out of the 144 on the Rand. The tons of ore crushed were 3,224,168 out of 22,033,857, and the stamp duty was 7.38 tons, as compared with 6.7 tons, the average over the Rand. The total mining profits of the group were £1,658,966 for the year ended August 31. During the year ended June 30 the profit made by the Gold Fields was £1,283,891, and dividends aggregating 35%, representing £700,000 were paid on the ordinary shares, as well as 6% on 1,250,000 preference shares of 5½% and £300,000 of debentures. Out of the year's profit £500,000 has been written off for depreciation of the mines, which are recognized as wasting assets. The Rhodesian interests of the

company include the Giant and Enterprice gold mines. Production at the first is still low, owing to the collapse of the main shaft. At the second the New Found Out property is giving fairly promising results. The discoveries at Abercorn in Rhodesia have induced the Consolidated Exploration & Development of Rhodesia, one of the subsidiary companies, to reorganize to the amount of £50,000. New capital has been provided and the Shamva claims are being acquired. Ancient workings have been traced along this property for 1500 ft. and the prospectors proved the veins by a series of shallow shafts and cross-cuts. Since the Gold Fields took up the property additional development has opened a body of banket 90 ft. wide assaying 12½ dwt. and at another point 30 ft. wide assaying 20 dwt. The labor question is causing the Gold Fields, as well as the other South African houses, some anxiety. Notwithstanding the increased number of natives employed and their greater efficiency due to the longer contracts made, there is still a shortage of labor owing to the great expansion of the gold industry.

The Simmer & Jack, the largest of the Gold Fields group, is one of the great mines of the Rand. According to the report for the year ended June 30, the ore raised amounted to 955,035 tons, of which 827,500 tons was sent to the mill. The 320-stamp mill crushed 831,040 tons and produced 145,613 oz. The six tube-mills treated 468,450 tons and yielded 60,969 oz. The sand plant treated 560,326 tons by cyanide and produced 66,521 oz., and the slime plant 270,514 tons producing 19,606. The total production was therefore 292,710 oz., valued at £1,233,151, the yield being 7.04 dwt. or £1 9s. 8d. per ton. The working expenses were £540,537, or 13s. per ton, leaving a profit of £694,186 or 16s. 8½d. per ton. The dividends distributed out of the year's profits totalled £675,000. Of the total ore won, 72% was broken by hand and 28 was mined by machines. The average stamp-duty was 7.43 tons per day. The average number of natives employed was 3658, or 500 less than during the previous year. This decrease is due to greater efficiency, gained by having yearly contracts. It is noteworthy also that only one shift per day is worked at this mine, resulting in a larger tonnage being won with less labor, a reduction in working costs, and increase in the profit. The amount of payable ore developed during the year was 895,732 tons. Owing to the reduction in costs it has been possible to include certain blocks of ore among the payable reserves. The reserves have been re-estimated on the new basis and are now given as 2,500,000 tons of an average assay value of 6½ dwt. During the year under review the assay value of the ore milled was 7.47 dwt., of which 7.04 dwt. was extracted, being a recovery of 94¼%. During the previous year the assay value was 8.14 dwt. with an almost identical rate of extraction. At the same time the cost fell from 16s. 2d. to 13s., and since the end of the financial year the cost has fallen to the extraordinarily low figure of 11s. 10d.

The troubles of the French Rand Gold Mine have suddenly come to an acute crisis, and the directors have decided on the temporary closing of the mine. The company belongs to the Wernher-Beit group and the property (in older days known as the Champ D'Or) is situated on the western end of the Rand at a point where the country is much broken. Probably it has been the most difficult to work of all the mines on the Rand for this reason. During the first half of the current year the mine suffered severely from floods, which disorganize mining and development, and for some months serious losses were sustained. On recovery from these troubles, the labor supply began to fail, the working force dropping from 1840 in April to 1178 in September. For the past 18 months the eastern part of the mine has been gradually abandoned and work concentrated at the western portion, where more encouraging results have lately been obtained. As much as 1032 ft. of development was done during September, and the results point to the existence of some unbroken stretches of reef of encouraging value. However, having regard to the limited ore reserves and shortness of labor, it has been found necessary to alter the policy of the company. It has been finally decided to close down until technical and financial conditions improve.

BRITISH COLUMBIA.**Coast District Mines. — Copper and Iron on Texada Island. — Lime Kilns.**

Mining of metalliferous minerals in the Coast district of British Columbia is not done on a large scale at the present time. In what is officially known as the New Westminster district work is practically restricted to two properties, the Britannia group, on Howe sound, and the Swayne group, on Lynn creek, eight or nine miles from the city of Vancouver. At the former about 100 men are employed, at the mines on Britannia mountain, and the mill and concentrating plant at Britannia Beach. In the mines exploration of the big orebodies is being continued by adits and shafts. At the mill experimental work in concentration is in progress. Meanwhile production is not on a large scale; only the hand-picked crude ore of higher grade and the concentrate made being shipped to the smelter. Zinc having been found in association with iron and chalcopryrite in a silicious gangue, a small Wetherill separating plant is being installed. At the Swayne group the Tyee Copper Co. is developing, but is not shipping to its smelting works at Ladysmith, Vancouver island, owing to the absence of transportation facilities.

On Texada island, also in the Coast district, the Marble



Mineral Resources of British Columbia.

Bay, Cornell, and Little Billy mines are being worked, and a cross-cut adit is being driven on a property known as the Malaspina mine. The Marble Bay, owned by the Tacoma Steel Co., is shipping to the smelter at Tacoma, Washington, from 1200 to 1500 tons of gold-copper ore per month. The first class ore averaging about \$30 per ton, and occasionally runs up to \$40, while the second grade returns about \$10. The ore is chiefly bornite, much of it contains \$10 per ton in gold, with silver up to \$5. The first class ore carries 5% or more of copper. The bornite ore occurs in considerable quantity, with indications of continuing down to a somewhat unusual depth. On the 960-ft. level the orebody has been developed for 210 ft. in length, with ore in the faces at both ends of the drift. It has a width of fully 20 ft. The Cornell, one of the Van Anda group, is being operated by the Northern Texada Mining Co., which also has a bond on the neighboring Copper Queen, of the same group. The Cornell is in the same mineral zone as the Marble Bay mine, and its ore is also bornite associated with chalcopryrite. Up to a few weeks ago shipments by the present operating company had totalled about 9000 tons, and the expectation was that the year's output would show an average of approximately 1000 tons per month, and the

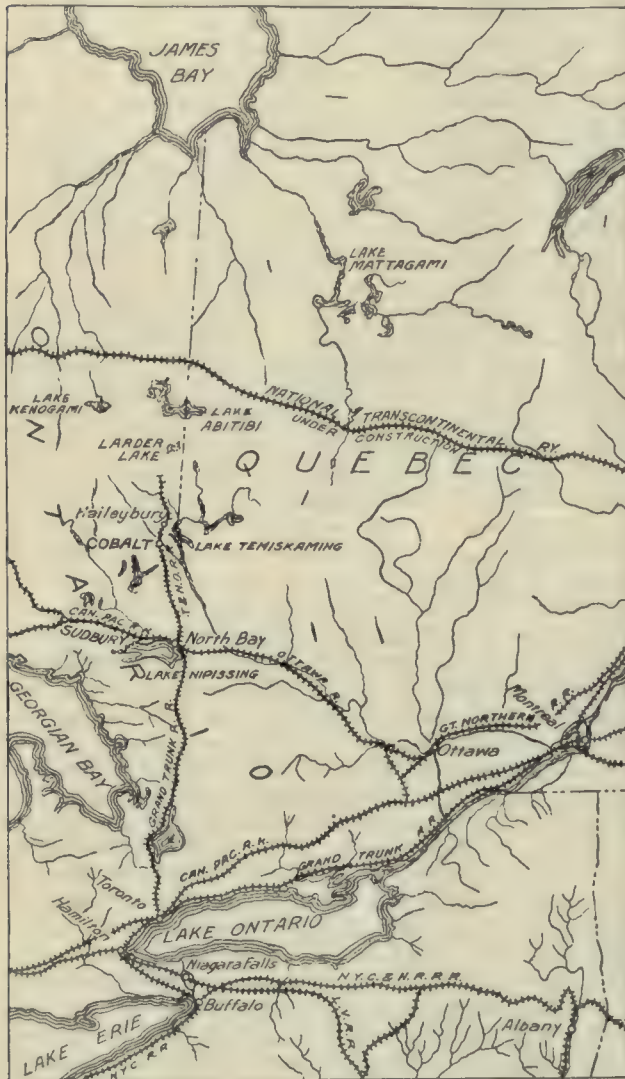
quantity of copper recovered during the year would be about 1,250,000 lb. The Little Billy Mining Co., of Seattle, Washington, has about completed the installation of a new power plant, consisting of a 80 hp. Robb boiler with duplex feed-pump; a 5-drill Canadian Rand air-compressor; an air-receiver 8 ft. by 36 in., and a 7 by 10 double-cylinder, single-drum Jenckes hoist, all housed in a building 100 by 35 ft., and covered with corrugated galvanized iron. Other improvements in hand are the erection of a head-frame 35 ft. high over the shaft, putting in new ore-sorting tables, and building a trestle 500 ft. from sorting tables to shipping bunker on tidewater with a double track gravity tramway. The shaft, now 100 ft. in depth, is to be deepened to 200 ft. and a level opened to connect with the orebody, which has an average width of 8 ft. This orebody was located last year by J. T. Taylor, superintendent of the mine, and after the metal content of 220 tons of ore shipped to the smelter had been ascertained, the equipment of the property with a new power plant was undertaken. The Little Billy was the first property near Van Anda on which copper ore in quantity was found, but the attention of the then owning company having been diverted to the Copper Queen and later the Cornell, it was neglected. The Puget Sound Iron Co.'s big iron and copper property, on the west side of Texada island, long owned in San Francisco, is again attracting the attention of mining men. It is now under option to Duluth, Minnesota, men, the purchase price named being large. It consists of about 3000 acres of land having a frontage of nearly five miles on the Strait of Georgia. Its mineral resources are chiefly iron and copper ores in comparatively large quantity; especially the former. Magnetite occurs along a distance of fully two miles, showing conspicuously in several high bluffs in which quarries have been excavated, giving faces of solid iron ore. The three more prominent occurrences of iron are known as the Prescott, Paxton, and Lake deposits, respectively. From these, chiefly from the Prescott, about 30,000 tons of ore have been shipped, and practically all of this was smelted in a small furnace at Irondale, near Port Townsend, Washington. The grade of the magnetite is high, up to 68% iron. The pig iron it makes is of good quality. A provincial mining engineer estimates about 30,000,000 tons of ore in sight on the Prescott, which has been opened by an adit from just above high-water mark, and driven 700 ft. into the mountain, entering the orebody at 700 ft. below one of its outcrops on a big bluff. The adit cross-cuts the ore for 100 ft., but did not pass entirely through it. No attempt has yet been made to ascertain the depth of ore below this tunnel level, so the area covered by this deposit and the tonnage available are undetermined. The ore on the Prescott is a coarse-grained granular iron, while that on the Lake is fine-grained. The copper ore deposits occur generally in close association with the iron near its contact with the enclosing country rock. Altogether about 3000 tons of copper ore have been shipped. No work is now being done on the property, but in 1908 lessees spent something like \$40,000 on surface equipment and development. The former included the installation of a small steam power plant, construction of a horse-tramway about 6500 ft. to tidewater, the erection of ore-bunkers at both ends of the tramway, and a shipping dock about 400 ft. long in Iron cove. Had a fully competent mining engineer been in charge, the operation of the copper mine probably would have been continued, notwithstanding the tightness of the money market and low price of copper. Other resources of the big Iron mine property, by which designation it has been long known, are extensive beds of good clay, extending about two miles along the shore line and up to half a mile in width, fine forests, estimated to contain up to 150,000,000 ft. of merchantable timber, chiefly Douglas fir, with a much smaller proportion of cedar, and about 1000 acres of land suitable for cultivation. The property has been held for many years by men of large means who have not done much with it. It now seems improbable that these inactivities will continue. Besides the above mentioned properties there are on Texada island a number of mineral claims upon which more or less development has been done, but as a rule, re-

sults have not been profitable. A lime-burning industry is in a flourishing condition, the Tacoma Steel company, operating, under the same management as is in charge of its mine (Alexander Grant, of Van Anda), four lime kilns at Limekiln bay, near the northern end of the island. The combined capacity of these is 300 to 350 bbl. per day. The lime is of superior quality and finds a ready market in the British Columbia Coast cities, and those of Puget Sound. Formerly much of the product was shipped to Honolulu, Hawaii, but cheap water transportation to that place can not now be regularly obtained, so a nearer market had to be found. The industry, which was established about 12 years ago, gives regular employment to 22 men. The Queen Charlotte islands and Portland canal are also in what is known as the British Columbia Coast district, but notice of mining, which is becoming important, in these parts must be deferred.

TORONTO, CANADA.

Gillies Limit. — Cobalt Production and Development. — Elk Lake. — Gowganda. — Coal Merger. — Coal Reserves.

The latest sale of mining lands on the Gillies Limit in the Cobalt mining district on November 16 went off satisfactorily, considering the depression in the market. Thirty-seven out of 55 lots were disposed of by tender at a total



Map Showing Portion of Ontario.

amount of \$372,462, or an average price of \$482 per acre. The interest in the sale was stimulated by the good showing made by the Waldman, the Wyandoh, and other properties on the Limit, which are being energetically developed. On the Wyandoh a vein of smaltite 3 in. wide containing native silver was recently struck at a depth of 11 ft. in the shaft. Notwithstanding the big dividends recently announced by the Crown Reserve—or perhaps because of the big dividends—the stock unexpectedly took a considerable

drop without apparent reason other than the nervous condition of the public and the general want of confidence in the stability of Cobalts caused by the La Rose slump and the weakness of other much boomed issues. Reports as to actual conditions at the mine are decidedly favorable. Vein No. 18, the Ross, has been recently struck at the 200-ft. level, showing undiminished silver content and giving the mine another 100 ft. of high-grade ore. Cobalt Lake has made a good strike in the cross-cut 28 ft. north in the drift at the 190-ft. level and near the McKinley boundary. The vein is 30 in. wide and carries leaf silver. The Wettlaufer mine in South Lorrain is developing well. A block of ore weighing 400 lb. with a vein over 12 in. wide containing silver to the extent of 5000 oz. per ton, taken from the 140-ft. level, is on exhibition in Toronto. The Hargrave, which for over a year has been looking for the continuation of the rich No. 3 vein of the adjacent Kerr Lake Mining Co., cut it a few days ago at the 375-ft. level. A new vein recently discovered on the Rochester has been stripped for 125 ft. and found uniform. An assay gave 5231 oz. silver per ton. A shaft is being put down. On the Gifford a 200-ft. shaft has been put down with a 10-ft. sump and a station cut at 200 ft. A cross-cut run at this level has penetrated two good veins, one of them showing silver. At the North Cobalt mines a depth of 200 ft. has been reached, but the ore is of lower grade. The shaft will be put down 50 ft. farther. The mine made its first shipment two weeks ago. The Temiskaming stamp-mill of 30 stamps is completed, though some machinery has yet to be installed. The rock will be crushed down to $\frac{3}{4}$ in. before it leaves the rock-house at the shaft and will be conveyed by aerial tramway 487 ft. to the mill which stands on rising ground. The Otisse of Elk Lake has for some time been involved in litigation, S. Kenyon Stowé, an English capitalist, claiming \$400,000 damages for fraud and breach of contract on the part of the promoters in failing to carry out an agreement to sell their claims to him. Kenyon's suit has been dismissed on the ground that he was not ready to make the preliminary payment of \$10,000 on his option. The Reeve-Dobie mine, Gowganda, has 35 tons of high-grade ore ready for shipment and a large quantity of low-grade. The company has done four miles of trenching and has put down three shafts, the deepest being down 90 ft. Shipments from Cobalt are well maintained, those for the week ending November 13 amounting to 940 tons, and for the week ending November 20 to 584 tons. La Rose continued well in the lead.

The contemplated merger of the Dominion Iron & Steel Co. and the Dominion Coal Co., of Nova Scotia, is making decided headway after a period of tedious negotiations. The Steel company as a preliminary step has secured a controlling interest in the Coal company by taking over 50,000 shares of the holdings of James Ross, the president of the Coal company at \$95 per share. A condition of the transaction was that all other shareholders of the Coal company were to have an opportunity of disposing of their stock on the same terms, which a number have already done, giving the Steel company about two-thirds of the stock. The merger, therefore, may be said to be practically accomplished, though many details remain to be arranged, and it will be some time before the basis on which the final amalgamation of the companies is to be effected will be settled. Meanwhile the strike of the employees of the Coal company is practically over, so far as the company is concerned, and it is announced that no more men are required.

The Canadian Geological Survey has issued a comprehensive report by D. B. Dowling on the coalfields of Manitoba, Saskatchewan, Alberta, and eastern British Columbia, which, together with a historical review, a description of the geology and topography of the coal areas, and an account of the different classes of coals and their values, contains a concise statement of the known area and probable contents of the coalfields in the prairie section. The total is estimated at 143,490,000 tons classified as follows: anthracite, 400,000,000 tons; anthracite and semi-anthracite, 860,000,000; bituminous and some semi-anthracite, 43,070,000,000; coal (lower grade) and lignite coal, 21,000,000,000; and lignite, 78,160,000,000 tons.

NEW YORK.

Copper Situation. — J. Parke Channing on Visible Ore Supply. — Cole-Ryan and Miami. — Copper Merger Plans. — Bear Movement.

The copper surplus has been attacked from a new angle. J. Parke Channing, consulting engineer of the General Development Co., and vice-president of the Miami Copper Co., has stated to your correspondent that he thinks the copper producers are in much the same position as holders of timber lands have been in this country for the past 20 years. Mr. Channing states that he has been for some months making an exhaustive study of the copper ore reserves underground, covering ore in sight and possible future ores to be developed, arriving at as close an estimate as possible of the future production of the mines of the world, so far as can be done from present conditions. The conclusion at which Mr. Channing has arrived, is that the copper supplies of the world are as nearly exhausted as are the available timber supplies. This conclusion has been reached only after several months of close study of the copper statistics of the world and, voiced by so well known and competent an authority as Mr. Channing, is entitled to a great deal of weight. The parallel between copper and timber is a patent one. It has not been many years since it came as a shock and a surprise when we learned that the regions around the lakes of Michigan and Wisconsin were to furnish no more cheap white pine. We had heard talk of over-production, had seen the markets loaded with a surplus, consumption almost at a standstill, when with a little revival of building, white pine went into the list of luxuries. The country turned to southern lumber, and the pine forests of the South disappeared into the sawmill almost before their passing could be noted. There is timber, a great deal of it, left yet, but from the present time, timber will more nearly approach each year the price which will approximate the cost of reproduction. That is to say it will sell for what it costs to grow it. Unfortunately for the user of copper, the parallel stops short of this point. Reforestation can give lumber but no alchemy can replace ore reserves once extracted. Mr. Channing is inclined to consider the present copper surplus as a result of mere temporary market conditions, taking the stand that when the real upward swing of the metal market makes itself felt it will disappear more quickly than now seems possible, and that future demands, with the constantly growing uses of copper, will soon place the producer in a position to dictate the price of the metal within any limit which will not absolutely forbid consumption.

If Mr. Channing is correct in his position a constantly advancing price for copper through a period of years is economically inevitable, and would be one of the major inducements for the formation of the much discussed copper merger. That exhaustion of ore reserves should be found to be practically in sight, just when the metal market has been talking of over-production would be the natural course of events; how well this position is taken can only be determined by the future, but the question is vital and worthy of careful study. It may be definitely stated that negotiations are under way whereby the Cole-Ryan people are to secure a large interest, if not the control of the Miami Copper company. Diplomatic denials of such a deal have been made by all parties in interest, but, while details are lacking, there is no doubt as to the fact. Copper-merger news has been definitely lacking during the past week; the Standard Oil decision changed the atmosphere completely. For the present, at least, all plans seem to have been held up. A sudden deference to anti-corporation sentiment seems to have appeared; the smelter trust, the mention of which causes so many smaller mining operators to 'see red', has been definitely dropped from the organization plans. The whole scheme of the combination appears to have been shifted from a pattern following the idea of the Standard Oil company, in owning a sufficient production to control the market, handling all of the product as selling agents, and in addition, taking toll for refining all of the product, to a rather benevolent organization, with market-stability for its chief end and aim, the whole to be submitted to Government scrutiny before the

details are adjusted. Meanwhile the market is in a rather disorganized condition. The foreign visible supply of copper has increased during the past two weeks about 2791 tons, which brings the foreign accumulation up to 236,864,000 lb. The November increase in foreign surplus was 14,304,640. If the present position in copper is to be improved, the decrease in surplus on this side must exceed these figures. Before the market setback caused by the Standard Oil decision, large sales were reported. Recently the metal market has suffered and there are bear rumors. Copper, it is said, will be sold at prices which will make production unprofitable for many mines and bring Washington into disfavor for interfering with plans.

MEXICO.

Aurora y Anexas. — La Blanca. — El Tajo, Jalisco. — Guadalajara. — Chamela Railway. — Zacualpan. — A. S. & R Controls Anganguero. — Oaxaca. — Onyx Development.

The La Aurora y Anexas company, owning mines to the east of the properties of El Oro Mining & Railway Co., at El Oro, State of Mexico, called a general meeting of shareholders to consider whether development work should be started once more. The meeting was represented by 1946 shares out of 3500. The important discoveries made in the El Oro camp by recent development work, have led the directors to believe it worth while to sink the shaft to a total depth of 500 ft., and drive cross-cuts. The owners of the La Blanca mine, at Pachuca, are placing orders for machinery for the mill that has been planned; 8 Pachuca tanks have been ordered from Grothe & Carter. These will be the largest yet built (60 ft. high by 15 ft. diam.). They will be built by the Hammond Iron Works, of Warren, Pennsylvania. The plant will include 6 Dorr classifiers, and 3 Dorr pulp-thickeners; 6 tube-mills of Krupp manufacture have also been ordered, that will be 4 ft. diam. by 20 ft. long.

The building of the Guadalajara-Chamela line is an assured fact. Construction will start in January beginning at La Vega, on the Ameca branch of the National lines, about 43 miles from Guadalajara, thence extending to the Pacific port of Chamela. It will open a rich mining zone and will be an important feeder to the National lines.

The Tajo Mining Co., San Sebastian district, Jalisco, is adding 10 stamps, 2 concentrating tables, and 8 sand and slime-tanks to its mill. Within another year further additions to the plant will be needed. Arrangements are being made to run the mill and air-compressor plant by water-power.

The Seguranza Mining Co., operating the old Coronas company's property in Zacualpán, is waiting for electric power to start its 100-ton mill. The main adit which has been driven during the past year, recently cut the vein at 245 ft. below the upper level. At this point the vein has a width of 36 ft., and as far as it has been tested the ore is high grade. George A. Waddel is president of the company. The Cinco Estrellas Mining Co., a close corporation operating a gold-silver property at Pinos Zacatecas, has just completed the erection of 10 additional stamps, making a total of 60. The capacity of the mill is 125 tons per day. The mill is equipped with a cyanide plant having straight percolation and decantation, sliming not being considered necessary.

The American Smelting & Refining Co. has recently acquired control, by lease, of the famous old silver mines of Anganguero, Michoacán. These mines have been shipping an average of 200 tons per month of high-grade ore to the Aguascalientes smelter. It is stated that the American Smelting & Refining Co. is arranging with the Mexican Light & Power Co. to run their power-lines into the camp, from the El Oro, only a few miles distant. The mines will then be equipped with modern machinery. L. R. Budrow, the former superintendent, will be retained.

The Teziutlán Copper Co., the owner of the Ocotes mines in Oaxaca, is said to be making arrangements for the erection of plant for treatment of pyritic ores by a new process, the rights of which were purchased by R. S. Towne. Great secrecy has been maintained in regard to it. The Natividad Mining Co. is negotiating a large loan with a local bank

to complete its cyanide plant and to erect other machinery. The Natividad mine has been one of the great producers of the State, and has been worked almost continually for 75 years, paying dividends steadily for a long time. The present policy is to suspend dividends and expend proceeds in developing the mine and improving the plant. The first export shipment of onyx from Oaxaca was made recently from the Magdalena quarries, several hundred tons being sent to New York.

GOLDFIELD, NEVADA.

Consolidated Report.—Development in Mohawk and Clermont.

The official report of the operations of the Consolidated company for the month of October shows a total production of 20,137 tons of ore containing \$794,420, or an average of \$39.45 per ton, all of which was treated by the company mill with an average extraction of \$37.28 per ton or 94.49%. The total net profit from this production was \$554,780, or \$27.55 per ton. Despite a reduction in tonnage owing to the loss of the Combination mill, the total profits showed a substantial advance due to high-grade ore produced in development in the Clermont workings. From this point and in development alone the production was 2301 tons containing \$225,905, an average exceeding \$98 per ton. New development by the company during the month amounted to 3743 ft., and is reported as usually successful, especially on the Mohawk 600 and the Clermont 750 and 900-ft. levels. Total operating costs, including mining, development, transportation, milling, office, and general expense, were \$6985 per ton including an extra charge for development in preparing for increased milling capacity, there having been 1303 ft. of this work more than in the preceding month. The caved area of the Hampton stope is being opened at the 230 and 280-ft. levels, and at the latter ore has been followed some distance south. Good results have been obtained in opening the old lease stopes north on the Mohawk, and ore is exposed in three cross-cuts in the foot-wall of the main ore-shoot at the 600-ft. Mohawk level. A large tonnage of good ore was broken in the Red Top during the month. For 220 ft. the south drift of the Clermont has exposed ore averaging \$170 per ton continuously and from this drift another has opened ore of similar character for 80 ft. on a cross-vein. The 900-ft. level has been in good ore for 320 ft., but both faces are now poor. No ore has yet appeared in the 1000-ft. level, which is being driven rapidly to the west.

SALT LAKE, UTAH.

Boston Con.—Utah Merger.—Utah Copper Sued.—Ohio Mill Started.—Ely Investments.—Silver-Lead Ore in Demand

A conference regarding the proposed consolidation with the Boston Con. and Utah Copper is being held in New York. The mines jointly are producing in excess of 7,000,000 lb. of copper each month. Utah Copper has worked some of its steam-shovel pits close to the end lines of Boston Con., and it would be greatly to its advantage to control Boston Con. properties. The rate of exchange proposed is $2\frac{1}{2}$ shares of Boston for one share of Utah Copper; as this is the third and final proposition made by the Boston company, it is a matter left entirely to the Utah Copper directors to accept or reject. E. A. Wall, formerly the largest individual shareholder in Utah Copper, has sued that company for \$1,290,000 damages for alleged extraction of ores from his Starless group. While in the Utah Copper he was very much opposed to the management and finally disposed of his entire holdings for some \$3,000,000. He is a large shareholder in Boston Con., and is opposed to a consolidation. In his complaint he bitterly attacks Utah Copper and asks for an injunction to prevent further operations and payment of dividends until his claim is settled. Mr. Wall originally owned the Utah Copper ground.

Ohio Copper is now running the first section of its mill at full capacity. Owing to the character of the ores Colin McIntosh reports that it is easy to reduce from 700 to 750 tons per day. This indicates that the mill will be able to treat 3000 tons per day, though planned for 2250 tons. A

fine discovery has been made on the Elvina vein at a depth of 500 ft. The ore carries 4% copper, 25% iron, and some gold and silver. This will be connected with the chute to the Mascotte tunnel. The mine is now sending 1000 tons of ore per day to the mill.

Samuel Newhouse and Windsor V. Rice have become interested in Ely. A group of claims between the McDonald-Ely and the Ely-Calumet have been acquired and will be incorporated under the name of the Ely Centennial. A force of men has been started on development and a tunnel is being driven at a point which will give them a depth of 500 ft. on the property. Five parallel veins cut across the ground from east to west, and a number of 'blow-outs' on the surface show silver, lead, gold, and copper in liberal quantities. The tunnel is within a short distance of the Nevada Northern road, and little expense will be entailed in opening the ore deposits. Some of the ore has been tapped by the tunnel and as it is direct smelting ore the Steptoe plant is dickering with the company for a contract to treat the output. Thomas Kearns has just returned from Ely and Duck Creek, accompanied by C. E. Allen, mine superintendent of the United States Smelting Co. They inspected the Success mine, which is shipping silver-lead ores to the local smelters. The object of the inspection was to ascertain what amount of ore could be produced, as the United States company is anxious to make contracts for ore of this character. They arranged for resumption of work at the McDonald-Ely, which is owned by Davis Keith, Thomas Kearns, E. A. Wall, and D. C. McDonald.

BUTTE, MONTANA.

Development Active.—Deep Shafts the Rule.—Everybody Busy.

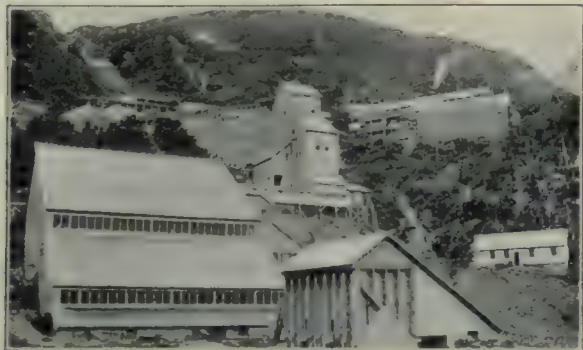
More development is being done in the Butte district than at any time in a number of years. The Amalgamated is sinking a new working shaft on the Gagnon mine, to take the place of the old incline shaft which is 2300 ft. deep. The new opening has reached a depth of 360 ft., and will be carried down to 2300. The main shaft of the Leonard mine, now 1800 ft. deep, is also being deepened, as is the Mountain Consolidated shaft of the Anaconda company, which is now nearly 2900 ft. deep. The deepest shaft in the district is the Diamond of the Anaconda company, which has a depth of 2956 ft., 600 of it having been sunk during the past year. The Belmont, another Anaconda property, has reached a depth of 1190 and sinking is still going on. The Belmont is a large 4-compartment shaft. It is understood that when completed it will be used as the main working shaft of the Anaconda and other hill mines. The Amalgamated is also sinking a shaft on the Badger State, a Boston & Montana property, which carries the western extension of the Jessie vein of the North Butte company. The shaft of the West Gray Rock, a Butte & Boston property, has been sunk 400 ft. during the present year, making it now 1100 ft. deep. Two hundred feet have been added to the depth of the Little Minah shaft of the Parrot company, and it is now 1200 ft. deep. The Moonlight shaft, a Washoe company property, was sunk from the 1300 to the 1500-ft. level this year. Altogether the Amalgamated company did 141,858 ft. of new work in the past 12 months, including shafts, drifts, cross-cuts, and raises.

The North Butte company has also done an enormous amount of work, and is still engaged in developing. With the exception of the work on the Granite Mountain shaft all the work is driving and cross-cutting. The Granite Mountain is being connected with all the levels of the North Butte and the shaft is being raised from different levels toward the surface. The Butte Coalition company has been developing steadily since it began operating the former Heinze mines. Both the Tramway and Rarus shafts are being sunk deeper, the former being 1900 ft. deep, and the latter 2200. The Tramway will be sunk to the 2200, and another 100 ft. will be added to the Rarus. Half a dozen new levels have been opened from the Tramway, and several great mines have been developed by the Coalition company.

General Mining News.

ALASKA.

(Special Correspondence).—Another lot of about 2500 tons of ore is ready for shipment at the Jumbo mine near Sulzer.—An examination of the Cuprite property is being conducted by W. L. Polson, of Ketchikan, with a view to its development on a large scale.—The barge at the Goodroe mine, at Karta bay, is now loaded and ready to



Alaska Perseverance, Juneau, Alaska.

sail with about 2700 tons of copper-gold ore.—Diamond-drill prospecting on the Jumbo extension by the Tye Copper Co. is said to be meeting with good success.—A preliminary survey of the wagon-road to the Unuk river mines has been made.—The shaft at the It mine is now down 175 ft., and a drift from this level has broken into high-grade ore.

Ketchikan, November 23.

ARIZONA.

COCHISE COUNTY.

A body of high-grade ore was opened by the raise on the 1250-ft. level of the Denn-Arizona property. A station has been cut on the 1350-ft. level and a drift started on the ore which will be driven to the fault found on the 1250.—Cross-cutting has been resumed on the 1500-ft. level of the Junction shaft of the Calumet & Arizona company driving toward the Briggs workings.—A 30-ton shipment of 50% matte was forwarded from the smelter of the Arizona United Mining Co., at Johnson, recently. Several minor changes have been made at the plant and 8 tons per day of matte are being produced.—The Empire company is opening some good ore at its property in the Dragoon district and will install machinery for power in the spring.—Operations have been resumed at the property of the Fairview Mining Company.

GRAHAM COUNTY.

The Arizona Copper Co., Ltd., is installing a briquetting plant at its smelter at Clifton. By briquetting of the concentrate the company expects to greatly increase the output of the blast-furnaces.—Several test runs have been made at the new mill at the Gold Belt mine in the Clifton-Morenci district and a few minor changes are being made. If this proves successful it is probable that a mill will be erected on the New York-Arizona property adjoining.

MARICOPA COUNTY.

Work has been resumed on the Finance group near Vulture, the ore taken out being stored for shipment to the Oro Grande mill.—At the Montrose group the shaft is down over 250 ft. The work will be continued to the 500-ft. level before the company commences cross-cutting.

MOHAVE COUNTY.

A station has been cut on the 500-ft. level of the Goldbug mine, in the Weaver district, and a cross-cut started to the vein. If the ore proves of as high a value on this level as those above, a mill will be erected at the property.—The main shaft of the Horseshoe mine, at Cerbat, is down 300 ft., and a station cut at that point. A cross-cut will be

driven to open the three veins which are known to exist on the property.—Five feet of high-grade ore was opened by the shaft at the Cyclopic mine.

YAVAPAI COUNTY.

Operations have been resumed at the Octave mine, at Octave, and a stockholder's meeting called for December 12 to outline the method of work. At the Joker shaft some excellent ore has been opened.—The shaft at the Tucker property, east of Octave, is down 50 ft. on the vein.—The Nevada-Arizona Copper Co. has installed a third churn-drill at its property north of Hillside and is building a wagon-road to the mine.

YUMA COUNTY.

A shaft has been started on the foot-wall of the vein on the Bowyer property, at Quartzsite, a contract having been let for the first 100 ft. Assays of ore taken near the surface averaged \$7 gold per ton and 11% copper.—The custom mill which W. E. Scott has just completed at Quartzsite is to make its initial run on 30 tons of high-grade ore taken from his claims in that district.—The Valensuela Copper Co., in the Quartzsite district, has struck considerable water in the bottom of the shaft at the 900-ft. level and will install heavier pumping machinery in the near future.

CALIFORNIA.

AMADOR COUNTY.

A dividend of 20c. per share was recently paid by the Argonaut Mining Co., at Jackson. Forty stamps are dropping in the mill.—A number of stockholders of the Amador Gold Mining Co. visited the Bay State and Rhetta mines owned by the company at Plymouth and as a result of the good condition of the mines it is probable that a 50-stamp mill will be erected within the next six months.—Twenty stamps are dropping in the mill of the Original Amador Mining Co.—The Kennedy Extension Gold Mining Co. has brought suit against the Argonaut Gold Mining Co., operating at Jackson, to recover \$200,000 damages for ore claimed to have been extracted from the former's ground by the latter company.

CALAVERAS COUNTY.

The adit at the Ariel mine, near Mokelumne hill, is in 170 ft., and has cut two veins. It will be continued till it opens the third vein which outcrops on the surface.—The workings at the North Star gravel mine are being re-timbered preparatory to the resumption of work.—Thomas Ewing is sinking a 2-compartment shaft at the Tulloch mine south of Angels and work will be started soon re-modeling the mill.—Operations are to be resumed at the Petticoat mine at Rail Road Flat.—The Dolling Gold Mining Co. is sinking a 2-compartment shaft at the North Star mine and a 40-stamp mill will be erected at the property.

INYO COUNTY.

The cross-cut on the lower level at the property of the Bishop Creek Gold Co., on the middle fork of Bishop creek, opened an 8-ft. vein of \$34 ore. The average assays of samples of ore taken from all portions of the mine have been over \$10 per ton. Paul E. Lodge, the manager, is authority for the statement that the company will erect a 50-stamp mill in the spring.

NEVADA COUNTY.

The Champion group of mines in the Nevada City district has been sold to a new company known as the Champion Gold Mining Co. The sale includes a number of the oldest and richest mines of the district, among which are the Champion, Providence, Wyoming, Merrifield, Home, Cadmus, Nevada City, and Spanish mines. George E. Fitzgerald is at the head of the company.—Schroeder & Torpie are to build a small mill on their claims in the Grass Valley district. A drift, now being run on the vein, is opening a good grade of ore.—Sinking has been started on the Colling ranch near Rough and Ready. Considerable rich placer ground was worked here in early days and several veins of quartz have been slightly prospected.—Work has been stopped for the winter on the Fairview mill near Washington on account of the heavy snow.—Lucian

Kahn has secured a bond on the Last Chance property near Maybert and will commence active work at once.

PLACER COUNTY.

A 10-stamp mill is being erected at the Crater mine in the Ophir district by W. P. Hammon.

SHASTA COUNTY.

The rich vein at the Uncle Sam mine, eight miles west of Kennett which was lost a number of years ago, has been found and shipping will be resumed on a large scale. L. C. Monahan is superintendent.—At the Clipper mine of the Carnegie Group of Mines Co. in the same district, rich ore has been opened and the company is to erect a 20-stamp mill. Fred Bowler is manager.—The clean-up of the plates at the Milkmaid mine in French gulch for the last 17 days in November resulted in \$8500 worth of bullion.

SIERRA COUNTY.

The adit at the Secret Ravine property in the Alleghany district is in 200 ft. and is expected to open the channel in a short time. Clifford Weldon is in charge of the property.—At the Oriflamme, on Chipps ridge, the adit is in over 200 ft. and has cut two veins. There still remains about 200 ft. of driving to open the main vein. C. C. Ward is manager.

TRINITY COUNTY.

Paulsen Brothers and Siligo & Wilson, operating leases on the Knob mine at Deadwood, are both mining ore that assays about \$500 per ton.—At the Lappin the mill is running 20 hours per day on good ore.—The mill at the Brown Bear is running on ore taken out by lessees.—Work has been suspended temporarily at the plant of the Trinity River Tunnel Mining Co., the force of the water being so great as to move some of the machinery. The damage is estimated at about \$2000 and repairs will be made at once.—R. A. Skinner, superintendent of the Mountain Boomer mine on New River, brought a \$10,000 gold bar to Weaverville.—The Wilson Hill mine near Knob has been bonded to Ross G. Beronda. The property is supposed to contain an extension of the Midas vein and has been worked intermittently for some time though no extensive orebodies have been opened. An 8-hp. Graupner mill and concentrator is to be installed at the Blue Jay property, near Carrville, the power being furnished by the Headlight plant. The shoot at the Blue Jay is 18 in. wide, and has been followed to a depth of 200 ft.—An arrastre is to be erected on the Belli property. The vein here is from one to four feet wide and the ore free milling.

TUOLUMNE COUNTY.

The electric current has been turned on at the Draper mine, all the machinery now being operated by electricity.—A suit to quiet title to a tract of land in the western part of the county has been instituted by Jay A. Rydberg and E. A. Rydberg against the Don Pedro Gold Mines Company.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—An orebody 2' ft. wide has just been cut by the winze that is being sunk on the Independence vein from the Tobin adit level. It assays \$70 per ton in gold, silver, and lead. C. L. Tingle is manager.—A shipment of 20 tons of smelting ore was sent out from the Santiago mine last week which netted \$2100. The ore was taken from a winze that is being sunk from the fourth level. William Rogers is manager.—Weaver & Son, operating the Kirtley mine on Leavenworth mountain, have just shot into an 8-in. streak of silver-lead ore that is worth from \$43 to \$47 per ton. This mine has produced over \$500,000 worth of ore, but remained idle for 15 years previous to a few months ago.

Georgetown, December 3.

(Special Correspondence).—A 3-ft. vein has been cut on the 13th level of the Sun and Moon mine on Seaton mountain. The ore is of a smelting character and one carload per day is being shipped, the returns being \$40 to \$50 per ton. O. W. Lowell is manager.—The Silver Horn mine has been taken under a two-year bond and lease by D. McDougall and associates.—Charles DeCamp, manager for

the Colorado Quito Gold Mining Co., is employing a force of men in cleaning out the Quito mine workings, and shipments of both smelting and concentrating ore will be started during the next two weeks.—The output from the Saratoga property now averages 30 tons per day of a smelting ore. The net earnings for the last three months have averaged \$800 per week. John Owen is manager.—Wright & Pellam, leasing on the Treasure Vault mine, made a 20-ton shipment last week to the Modern smelter at Utah Junction.—New mine buildings have just been constructed at the holdings of the Princess Alice Mining Co., on Fall river. J. F. Kaminky, the manager, states that early the coming week a modern concentrating mill will be started.

Idaho Springs, December 4.

GILPIN COUNTY.

About 20 tons of milling ore which had been stored on the dump of the Perigo mine from the lease of Bone & Eva, was treated at the Perigo mill and several tons of smelting ore shipped to Black Hawk.—A new 100-hp. boiler has been installed at the Gold Chollar mine in Prosser gulch.—



Perigo Mill, Gilpin County.

The cross-cut at the Tregay & Co. lease on the War Eagle mine at Gilpin, opened two feet of copper-iron ore and several stopes will be opened preparatory to shipment to the smelter.—The Slide Mining Co. has unwatered its property and will ship a carload of ore to the Modern smelter. M. A. Harris, of Russell Gulch, is in charge of the work.

LAKE COUNTY.

A rich shoot of silver ore has been opened by lessees on the old Ella Beeler property, in Iowa gulch. The vein is a foot wide, and assays from the richest portion have been over 75% silver.—Operations are to be resumed at the Big Four mine on Breece hill. A large amount of high-grade ore has been shipped from the property in the past and it is expected to become an important producer when opened on a large scale.—The power company has completed its lines to the Sugar Loaf district and a number of the mines are changing their power equipment. A complete plant is being installed at the Sagnache adit.—L. R. Johnston, operating the Iron Mask mine, at Leadville, has opened several good orebodies and is shipping sulphide ore.—The Connors Bonanza group has been taken over by the Elk Mountain Mining & Leasing Co., and the old workings are being re-timbered. Terry Connors is manager.—Operations have been resumed in the Printer Boy mine by a number of lessees.

OURAY COUNTY.

The report of the Camp Bird, Ltd., recently issued, states that the gross production was \$2,230,000, dividends for the fiscal year, \$964,000, and \$2,360,000 profit in the ore blocked out. A new discovery has been made on the fifth level, opening a body of ore that assays from \$50 to \$70 per ton.—A 6-in. vein of high-grade silver ore has been opened in the El Mahdi mine for 50 ft., and a stope started.—

Jackson & Weatherly, operating the Wedge property under lease, shipped a car of ore and are getting the mine in shape for a heavy production.

SAN JUAN COUNTY.

Operations have been resumed at the Old Hundred mine, in the Silverton district, which was shut down two years ago. There are 30 claims in the group which is equipped with an excellent mill and power plant.

SUMMIT COUNTY.

Operations have been temporarily suspended at the Wellington mill owing to the shortage of railroad cars.—The ore at the Sallie Barber property is being stored as the roads are too bad for hauling.

TELLER COUNTY.

Love & Thirkell, sub-leasing on the second level of the American Eagles mine, have opened a body of ore that assays from \$40 to \$80 per ton. The last few feet of the work has been in extremely rich ground, the ore being sacked in the stopes for shipment.—The Joe Dandy Mining Co. is re-timbering the shaft at the Eclipse No. 1 claim and has let several leases on blocks of ground in the Eclipse and Jo Dandy claims.—S. N. Simmons has secured a two years' lease on a portion of the Rittenhouse Gold Mining company property and is opening good ore on the 500-ft. level.—The quarterly report and dividend checks for ¼c. per share were mailed to the stockholders of the Doctor-Jack Pot Mining Co. on December 1. The report states that a new electric compressor has been installed at the Davenport shaft, that nine sets of lessees are shipping ore, and the suit against the Work Mining & Milling Co. over apex rights will be brought up next January.—The report of the Gold Dollar Mining Co. for the past quarter stated that the company had a surplus of \$13,244 on hand, but that no dividend would be paid as it was the intention of the management to resume work on company account, and that a cash balance would be necessary in starting this work.—During November the lessees operating on the El Paso properties shipped 2500 tons of ore. That from the mine assayed from \$28 to \$30 per ton, and that from the dump \$6 to \$8.—The Roosevelt drainage tunnel was advanced 298 ft. the past month making a total of 11,705 feet.

A promising ore-shoot has been opened by lessees on the 325-ft. level of the Hull City shaft of the Vindicator Consolidated Gold Mining Co.—The output of the mines of the Cripple Creek gold mining district for the month of November totalled 50,215 tons with a gross bullion value of \$1,284,487. Local mills treated a better grade of ore, and the average value of the smelting ore was \$1 per ton higher than the preceding month, and the general average of all grades treated was \$21.67 as compared with \$20.30 for October.—As compared with the tonnage of October there is a decrease approximating 4500 tons and about \$7100 in valuation.

| Plants. | Tons Treated. | Average Value. | Gross Value. |
|------------------------|---------------|----------------|--------------|
| Smelters | 4,125 | \$66.00 | \$272,250 |
| Golden Cycle Mill..... | 25,380 | 20.40 | 517,742 |
| U. S. R. & R. Co..... | 13,010 | 22.00 | 286,220 |
| Portland G. M. Co..... | 9,000 | 19.00 | 171,000 |
| Gold Issue Mill..... | 1,800 | 5.00 | 9,000 |
| Isabella | 1,750 | 4.50 | 7,875 |
| Trilby Mines Co..... | 1,650 | 6.00 | 9,900 |
| Wild Horse Mill..... | 1,500 | 5.00 | 7,500 |
| Gaylord Mill | 1,000 | 3.00 | 3,000 |
| Total | 59,215 | \$21.67 | \$1,284,487 |

IDAHO.

OWYHEE COUNTY.

The Dewey Homestake Mining Co. has been organized to open the Dewey Homestake mine near Silver City. There is a large outcrop on the property and a shaft has been sunk 300 ft. on the vein. George Schlack is superintendent.—The north drift at the Banner mine cut the vein beyond the fault showing quite an improvement in the ore.

SHOSHONE COUNTY.

Fifty cars of native silver ore have been shipped from the Caledonia mine near Wardner netting the company \$5000 per car. The orebody containing this rich ore was opened recently on the lowest level of the property.—The shaft of the North Bunker Hill Mining Co. cut an orebody that assayed 13% lead, 7% copper, and 3 oz. silver per ton at a depth of 100 ft.—The adit at the property of the Index Mining & Milling Co. is in 600 ft., and it is expected to cut the vein about the first of the year.—The vein at the Black Bear Fraction mine was cut by the adit when in 700 feet.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—A number of companies are at work developing the deep ores in the Galena field, among the more recent of which is the Big Six Co., on the Murphy land. A drill-hole was put down 240 ft. a number of years ago cutting ore below the 200-ft. level, but as deep ore was then untouched and ore was sold at a low price, it was never opened. The new company drilled several holes in the vicinity of the former find and verified the old record, finding rich ore between 240 and 280 ft. A 250-ton mill will be built, the shaft sunk 280 ft., and later deepened to 350 ft. The ores are of the sheet variety.—The Galena camp is being materially extended to the south by the development work of the Clermont Mining & Milling Co., under the management of Joe Fahlenbach. This company has been prospecting and developing a 500-acre tract on Shoal creek and has demonstrated some good runs at varying levels, the upper from 40 to 60 ft., a second from 150 to 200 ft., and a third from 222 to 300 ft. Several shafts have been sunk by the original company and also by sub-lessees. The company is just completing a large new plant and will soon be ready for operation.—Frank Nicholson is now developing a 40-acre lease on the Murphy land, and has bought a 200-ton plant of McNeal & Co., from the Joplin camp, for the new lease. This tract has two shafts in ore at 155 ft.—The Diplomat Mining Co. recently secured a 10-acre lease from the Galena Lead & Zinc Co., including the old Mayflower mine.—The New England Mining Co. has just purchased a 440-acre tract from the O'Neal heirs and is preparing to prospect the ground.

Galena, November 13.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The Cliffwood Mining Co., on the Deerstone tract, is beginning the erection of a 150-ton mill. Three shafts are in ore at a depth of 180 ft.—A shaft on the Van Hoose 40 acres opened over 20 ft. of ore at the 143-ft. level.—Among the more promising new properties between Carthage and Alba is the I. C. Hodson land where three drill-holes have cut ore at 240 ft., the drill penetrating a 38-ft. face, and the Tanger land where a shaft is being started. The Consolidated Troupe Co. has just completed a 300-ton mill on the Hallwood farm and is sinking a new shaft.—On the Continental ground also west of the city, the new Clarke mill, formerly the Buckeye taken from Fairview cemetery, is now producing.—The Temagami mine, also on the Continental land, is working at a depth of 200 ft. where a much larger percentage of lead is being taken out than zinc, which is unusual in this district at that depth.—The Mandarin mine, at Chitwood, is being re-opened and an excellent body of ore is in sight, the best in the history of this mine.—A shallow discovery, resembling the old time finds, has just been made in the Zincite camp by Dix & Co. The ore was found at 50 ft., partly in large chunks and partly finely disseminated through the gangue.—Two excellent mines are being operated on the Old Dominion land at Smelter Hill, the Big Eight, and the Damphino. The ore is unusually rich. On a recent run of 862 tons through the mill, 86 tons of zinc and five tons of lead were procured.—Owing to a reduction of royalty on the city land near Fairview cemetery, the Adirondack company has undertaken the development of the lower sheet levels. The lower run is found to occur from 188 to 218 ft.—The old Hyde Park mine in the

Prosperity camp has been leased by Frank Nicholson, and will be put in operation as soon as the ground is drained.—The mill is modern and practically new with a capacity of 250 tons.

Joplin, December 4.

MONTANA.

SILVER BOW COUNTY.

(Special Correspondence).—The Butte & Superior Copper Co., Ltd., owning one mile of the Rainbow lode, adjoining the Alice group on the east, in Butte district, has opened the property to a depth of 1600 ft., the development from the shaft showing the lode to be about 200 ft. wide, between granite walls, the ore-shoots being from 12 to 60 ft. wide. The ore is a zinc blende in quartz; it carries 25% zinc, 5 to 30 oz. silver per ton, 60% silica, and only about 2% iron. The hoisting is done by steam power, and an electric-driven Allis-Chalmers air-compressor is being installed which has the capacity of 2500 cu. ft. of free air per minute. To treat the ore a concentrating mill of 500 tons per day capacity is being constructed, the equipment for the greater part having been purchased from the Allis-Chalmers Co. The construction work will continue through the winter. The company has arranged to operate the Basin concentrator on its ore during the period required to construct the new mill. The operation of the Basin plant will begin in January, and it is stated that 10,000 tons per month will be shipped to it. D. F. Haley, formerly with the North American Lead & Zinc Co., will have charge of the Basin mill. R. M. Atwater, general manager for the company, states that a 10-years contract has been entered into with the American Metal Co., Ltd., whereby the latter will take the concentrate. M. W. Atwater is superintendent of the mine.—The Davis-Daly Copper Co., for which Alfred Frank is superintendent, has reached a depth of 1851 ft. in its Colorado shaft, situated below Park street, near the centre of Butte. At the shaft is a 100-ft. steel head-frame and a first-motion, flat-cable, steam hoist, Webster, Camp & Lane make, capable of operating to a depth of 2000 ft. There are three air-compressors—a Nordberg, 22-drill capacity, electrically driven; a Franklin electric of 10-drill, and one of 6-drill capacity, steam-driven. Mr. Frank states that a large tonnage of ore is exposed. The company ground extends 4000 ft. west and 1400 ft. east from the shaft. On the 1400-ft. level is said to be an ore-shoot 700 ft. long. Driving has been commenced in ore on the 1500-ft. level, and a station has been cut at the 1800. The veins on the property average 20 ft. wide, 15 ft. of which is pay ore. This is said to contain $2\frac{1}{2}$ to 4% copper, 6 oz. silver, and 50c. gold per ton. The concentrator at Basin belongs to allied interests, and one part will run on Davis-Daly ore, handling 500 tons per day. The strike of the switchmen on the Northern Pacific has cut off the coal supply of Butte and in consequence the Moonlight and Parrot mines of the Amalgamated company have been forced to shut down temporarily.

Butte, December 4.

NEVADA.

ESMERALDA COUNTY.

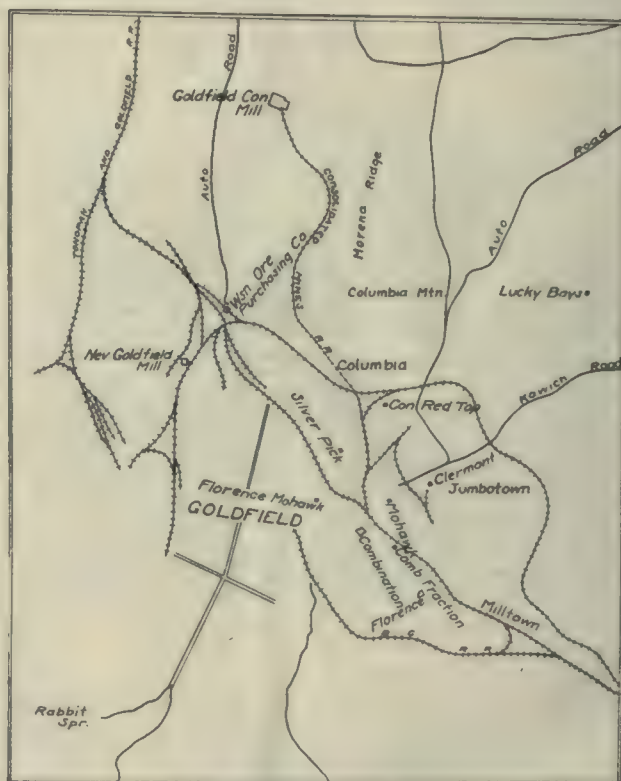
(Special Correspondence).—An extension of lease on the 20-stamp mill of the Nevada Goldfield Reduction Co. has been secured by the Combination Fraction company, and it is announced that operations of both mine and mill will be resumed at once. Development work, although upon a reduced scale, has been in progress almost continuously since the announcement of the suspension of operations was made.—Local operators have secured a lease upon a portion of the company workings of the C. O. D. Consolidated, including the plant at the main shaft on the Gold Bar claim where a considerable tonnage of low-grade, free-milling ore is exposed.—Foreclosure proceedings have been instituted in the District Court against the Diamondfield Black Butte Consolidated company to force a sale of the property and obtain judgment for the chief creditors who have assigned their claims, amounting to some \$16,000, to the Registration Trust Co., of Goldfield, with instructions to reorganize the concern upon an assessable stock basis. Lessees are still taking some rich ore from these claims.

—The shaft of the Thomas lease, on Columbia mountain, is following a strong vein on the incline, carrying a foot of shipping ore in 8 ft. of vein-matter, and will drive a raise from the old company adit for air connection while driving on the vein at the 160-ft. level.—William MacKay and associates are taking out rich ore from the original St. Ives shaft on territory of the Goldfield Merger Mines Co. Work has been started on the south end of the Booth by lessees who are seeking the extension of the Red Top vein while others will drive for the same vein system on the Night-hawk group.

Goldfield, December 6.

LINCOLN COUNTY.

A raise has been started from the 100-ft. level to the surface of the Pioche Metals property and when completed the gasoline hoist of the company will be installed and sinking commenced.—A rich vein was opened by the cross-cut on the 500-ft. level of the Golden Prince mine



Goldfield District.

when 230 ft. from the shaft. Some rich specimens of wire-silver have been taken from the recent discovery.—Hoisting equipment has been shipped to the Gold Chief Mining Co., at Pioche, from Salt Lake, and the company is considering erecting a mill in the spring.—About 50 tons per day are being shipped from the Prince Consolidated at Pioche.

NYE COUNTY.

Lessees on the Jim Butler ground are all stoping ore. On the Star lease the cross-cut has opened several stringers of quartz from which a good grade of ore is picked. The California lease is in good ore on the 150-ft. level.—On the 540-ft. level of the Silver Top workings of the Tonopah Mining Co., the west drift from the south cross-cut is being driven on a 4-ft. vein thought to be the extension of the main vein beyond the fault. In the Mizpah workings the south cross-cut from the southwest drift on the 400-ft. level is opening a body of low-grade milling ore.—Operations have been resumed at the Belmont, the repairs to the foundation of the compressor having been completed.—Considerable prospecting is being carried on at the 800-ft. level of the MacNamara.—The McGhan lease on the Blue Jacket at Round Mountain is in good ore and the lessees are storing it on the dump till they get enough for a mill-run.—The Solid Gold mill has again been started on ore from the Daisy mine.

WHITE PINE COUNTY.

The pit of the Nevada Consolidated at Copper Flat is attaining such a depth that getting out the ore from its lowest point is becoming quite a problem. Only two cars can now be hauled at a time from the lowest point in the pit to the main line of the railroad. There is, of course, plenty of ore available along the sides of the pit, but the bottom is still entirely in ore and the management must soon either cut into the lower levels with an adit driven from quite a distance or use locomotives of some type capable of climbing heavier grades than those now in use. Only about 240 ft. now intervenes between the bottom of the new Giroux shaft and the top of the raise from below. The miners are making from $6\frac{1}{2}$ to 7 ft. per day in the raise.

—Great satisfaction is expressed in the district over the positive announcement of the immediate commencement of construction of the new railroad, to be known as The Ely Route, between Ely and Goldfield. Leaving Ely, the road will traverse nearly the entire mineral belt of the district. On the Giroux estate, a deep cut must be made, a portion of which will be through the characteristic porphyry ore which has given this district its reputation. The road will be by far the shortest route from the East to southern Nevada when taken in connection with the Western Pacific and Nevada Northern. It will open a new and desirable route from Salt Lake to Los Angeles by way of Ely and Goldfield and will assist in the development of a great mineral and ranching country in central Nevada.—The Ely Silver, Lead & Copper Co. is to resume work at its holdings 12 miles east of Ely.—The Steptoe Valley Smelting & Mining Co. is to add a lead furnace to its plant and will treat the lead ores of the district.

UTAH.

JUAB COUNTY.

(Special Correspondence).—A great deal of attention is being paid to the operations in the eastern portion of the Tintic district. In such dividend payers as the Colorado, Sloux Consolidated, and Iron Blossom, the ore deposits in the upper levels are being worked out. Engineers are beginning to believe that there is a rich stratum of ore that passes through that district near the surface, as no deep working in these properties have brought encouraging results. A depth of 1300 ft. in the Iron Blossom and 1100 ft. in the Beck adit have failed to disclose a commercial grade of ore in paying quantities. Moving farther to the east of these properties a small deposit has been opened in the East Tintic Development ground from 100 to 300 ft. from the surface. Just recently a large deposit of talc has been cut at a depth of 200 ft. in the Gruttl ground, and on the hanging wall of this formation 2 ft. of silver-lead ore has been exposed. John Bestlemeyer, one of the pioneers of the camp, is manager of this property, and he intends to sink to greater depth at once, as the ore is dipping downward, and some of the greatest deposits have been found below the talc in that district.—Walter Fitch, president of the Chief Consolidated properties, in Tintic, reports splendid progress in the development of this ground. They began in October extracting some silver-lead ores from a depth of 1700 ft. This work has been continued below the 2000-ft. level, and during November an extraction was made that will net the company in the neighborhood of \$25,000. Drifts are to be extended under the town of Eureka, where this company has secured all the mineral rights, and Mr. Fitch is confident that his company will be able to mine a first-class grade of ore for a number of years to come. The company owns a large block of ground adjoining the Centennial-Eureka mine, owned by the United States Smelting R. & M. Company.

Tintic, December 3.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The shipment of 11,616 tons from the Mother Lode mine of the British Columbia Copper Co. made a new record in high shipments for the week, while the output of the Oro Denoro mine of the same company dropped several hundred tons, on account of the crew

being reduced.—Application has been made in the Supreme Court at Vancouver that the money now in the hands of P. F. Roosa, the liquidator of the Dominion company, be paid into court, and the liquidator released on the ground that he failed to advertise for creditors. The case was adjourned for three weeks, awaiting further evidence from New York.—During the month of November the Granby plant treated over 120,000 tons of copper-gold ore, equivalent to about 31,680,000 lb. copper per annum.—The total shipments for the week from the Nelson district are rather light. The McAllister sent out a small initial shipment, the Alice made its second consignment to the Trall smelter, while the shipments from the St. Eugene were the heaviest that have been made this month.—A 20-ft. vein of good milling ore has been opened in the United mine, of the Highland-Buckeye company. J. S. Airheart is manager.—The International Coal & Coke Co., at Coleman, is shipping steadily at the rate of 2500 tons per day. The company is working 215 coke ovens. The company recently sold a couple of hundred shares of treasury stock and paid off all its indebtedness, including a bond issue of \$300,000.

Rossland, December 3.

ONTARIO.

Prospecting on the surface has been concluded at the Nipissing property in Cobalt. During the past year 33 miles of trenches have been dug on the ground uncovering 24 veins of which No. 122 was the bonanza, as something over \$200,000 worth of ore has been mined from it. The vein has been traced for 670 ft. underground, having an average width of 6 in.—It is announced that Crown Reserve will pay the regular 15% dividend for the last quarter of this year, and an extra dividend of 10%.—It is reported that the interests controlling the Kerr Lake Mining Co. have secured control of the Temiskaming mine.—The cross-cut on the 60-ft. level of the Nancy Helen opened a rich stringer about 80 ft. from the Boston line.—A shaft started on a barren calcite vein on the Wyandoh property opened 3 in. of smaltite at a depth of 9 feet.

MEXICO.

CHIHUAHUA.

Luis Terrazas, Jr., J. W. Clayton, and Charles Seawell, of Chihuahua, have been granted a concession by the State Government to build a smelter at Temosachic. The concession is for ten years with exemptions from State and municipal taxes, and the concessionaires plan to erect a 100-ton plant to treat the copper-gold-silver ores of the district.—The capacity of the plant of the Rio Tinto Mining Co., operating near Terrazas, is to be doubled and converters installed, bringing the capacity of the plant up to 400 tons per day.—Eight Pachuca tanks have been ordered for the Blanca cyanide plant at Pachuca, six Dorr classifiers, and three pulp thickeners. The Pachuca tanks are the largest ever constructed, being 15 ft. in diameter and 60 ft. high.—It is reported that the American Smelting & Refining Co. is to enlarge its lead smelter at Chihuahua from 450 to 750 tons per day capacity, and to discontinue shipping lead fluxing ores to the El Paso plant.—Contracts have been let by the Palmilla company, which is building the 1000-ton mill at Parral to the Minneapolis Steel & Machinery Co. for a complete power plant and to the Allis-Chalmers company for the milling machinery.

JALISCO.

The Amajac Mines Co. has been organized to take over and operate the Refugio-Animas group, Amajac mill, Tres Estrellas mine, and adjoining claims formerly operated by Carlos Romero. W. R. Ramsdell is at the head of the company.—The Tajo Mining Co., operating in the San Sebastian district, has ordered ten stamps, two concentrating tables, and eight tanks for additional equipment in the mill. This will double the capacity of the plant.

ZACATECAS.

The Cinco Estrellas Mining Co. has completed the installation of ten additional stamps in its plant at Pinos raising the capacity of the mill to 125 tons of ore per day. H. R. Levick is superintendent.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. A. SCOTT is at Butte.

A. E. DRUCKER is in London.

D. C. JACKLING is in New York.

ALBERT BURCH has gone to Mexico.

GEORGE S. RICE has been at Chicago.

A. P. ANDERSON is in San Francisco.

L. A. GREENE has returned to San Francisco.

H. V. WINCHELL is at Spokane, Washington.

ALGERNON DEL MAR was in San Francisco this week.

W. J. ADAMS has returned from Kern county, California.

ROBERT SCHORR has gone to Denver on professional business.

FRED HELLMAN has returned to New York from San Francisco.

C. W. PRITCHETT, of Denver, was at Butte, Montana, last week.

S. W. BURBRIDGE, of Colorado Springs and Denver, is in New York.

LESTER W. STRAUSS has returned to Lima, Peru, from a trip to Chile.

R. A. F. PENROSE, Jr., has returned to Philadelphia from the Southwest.

SAMUEL NEWHOUSE has been called to Paris by the sickness of his brother.

J. FRANK BECK and THOS. NUTTAL MILLER, of the Bully Choop G. M. Co., are in San Francisco.

J. CUTHBERT WELCH is smelter superintendent for the East Butte Copper M. Co., Butte, Montana.

A. A. SMITH has resigned as superintendent for the Farah Mining Co., at Cobalt, and will go to Mexico.

DARSIE C. BARD, mining engineer, Butte, Montana, recently visited the Coeur d'Alene mining district, Idaho.

ALEXANDER LEGGAT, who was engaged for the season in engineering work in eastern Montana, has returned to Butte.

CHARLES KAMMERER is manager for the Conrey Placer Mining Co., operating three gold dredges at Ruby, Montana.

DAVID LADD, formerly with the Michigan Smelting Co., goes to Australia with the Wallaroo & Montana Smelting Company.

EDWIN J. COLLINS, of Duluth, Minnesota, sailed from Seattle on December 1, for Alaska for a four weeks' mine-examination trip.

WILLIAM KEMP, consulting mining engineer for the Calumet & Arizona Mining Co., was a business visitor to San Francisco this week.

THEODORE DWIGHT is at Guanajuato, Mexico, on business connected with the purchase of the Tajo de Dolores property by the Proprietary Mines Company of America.

R. M. ATWATER and M. W. ATWATER, of New York, are general manager and superintendent, respectively, for the Butte & Superior Copper Co., Ltd., operating at Butte, Montana.

J. B. FLEMING has completed the plant for the Globe Light & Power Co., at Daunt, California, and is now building a hydro-electric plant in the Sequoia National Park for the Mount Whitney Power Company.

S. H. BALL, formerly of the United States Geological Survey, and more recently in charge of the prospecting for the Société Internationale Forestière et Minière du Congo, has opened an office at 71 Broadway, New York, as consulting mining geologist. He is at present on professional work in New Mexico.

THE San Francisco Section of the Mining & Metallurgical Society will meet at the Palace Hotel, at 6:30 p. m., December 15.

Market Reports.

LOCAL METAL PRICES.

San Francisco, December 9.

| | | | |
|--------------------------|------------|--------------------------|--------|
| Antimony..... | 12-12½c | Quicksilver (flask)..... | 50½-51 |
| Electrolytic Copper..... | 15½-16½c | Spelter..... | 7½-8¼ |
| Pig Lead..... | 4.65-5.60c | Tin..... | 34-5½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per 100. |
|-------------|----------------------|-------|----------|------------------|
| Dec. 3..... | 13.12 | 4.40 | 6.34 | 51½ |
| " 4..... | 13.12 | 4.40 | 6.34 | 51½ |
| " 5..... | Sunday. No market. | | | |
| " 6..... | 13.12 | 4.40 | 6.33 | 51½ |
| " 7..... | 13.18 | 4.40 | 6.31 | 51½ |
| " 8..... | 13.18 | 4.40 | 6.30 | 51½ |
| " 9..... | 13.18 | 4.40 | 6.28 | 51½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Dec. 1. | Dec. 9. |
|------------------------|---------|---------|
| Camp Bird..... | 1 8 0 | 1 8 6 |
| El Oro..... | 1 5 9 | 1 5 7½ |
| Esperanza..... | 2 15 6 | 2 15 7½ |
| Dolores..... | 1 8 9 | 1 8 9 |
| Oroville Dredging..... | 0 9 9 | 0 10 9 |
| Mexico Mines..... | 6 0 0 | 6 7 0 |
| Tomboy..... | 0 18 9 | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

| Closing Prices. December 9. | Closing Prices. December 9. |
|--------------------------------|--------------------------------|
| Adventure..... | 6 |
| Allouez..... | 56 |
| Atlantic..... | 11½ |
| Calumet & Arizona..... | 101 |
| Calumet & Hecla..... | 650 |
| Centennial..... | 37 |
| Copper Range..... | 81¼ |
| Daly-West..... | 8½ |
| Franklin..... | 15¾ |
| Granby..... | 101 |
| Greene-Canaan, ctf..... | 12½ |
| Isle Royale..... | 26 |
| La Salle..... | 15 |
| Mass Copper..... | 7 |
| Mohawk..... | 60 |
| North Butte..... | 56 |
| Old Dominion..... | 51 |
| Osceola..... | 167 |
| Parrot..... | 28¾ |
| Santa Fe..... | 2½ |
| Shannon..... | 15½ |
| Superior & Pittsburg..... | 16 |
| Tamarack..... | 64 |
| Trinity..... | 101½ |
| Utah Con..... | 44½ |
| Victoria..... | 3½ |
| Winona..... | 8 |
| Wolverine..... | 145 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, December 9.

| | | | |
|---------------------------|-------|----------------------------|------|
| Atlanta..... | \$ 10 | Mayflower..... | \$ 6 |
| Belmont..... | 65 | Midway..... | 17 |
| Booth..... | 10 | Montana Tonopah..... | 85 |
| Columbia Mtn..... | 6 | Nevada Hills..... | 70 |
| Combination Fraction..... | 45 | Pittsburg Silver Peak..... | 65 |
| Daisy..... | 9 | Rawhide Coalition..... | 18 |
| Fairview Eagle..... | 12 | Rawhide Queen..... | 16 |
| Florence..... | 2.70 | Round Mountain..... | 65 |
| Goldfield Con..... | 7.95 | Sandstorm..... | 5 |
| Gold Kewenas..... | 5 | Silver Pick..... | 9 |
| Great Bend..... | 3 | St. Ives..... | 9 |
| Jim Butler..... | 9 | Tonopah Extension..... | 50 |
| Jumbo Extension..... | 14 | Tonopah of Nevada..... | 6.50 |
| MacNamara..... | 30 | West End..... | 22 |

(By courtesy of the San Francisco Stock & Exchange Board.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. December 9. | | Closing prices. December 9. | |
|--------------------------------|---------|--------------------------------|----------|
| Amalgamated Copper..... | 87 | Miami Copper..... | 18¾ |
| A. S. & R Co..... | 112½ | Mines Co. of America..... | 7-16 |
| Boston Copper..... | 20¾ | Montgomery-Shoshone..... | 1 13-16 |
| B. C. Copper Co..... | 7¾ | Nevada Con..... | 27½ |
| Butte Coalition..... | 29½ | Nevada Utah..... | 1 7-16 |
| Cumberland-Ely..... | 9 11-16 | Newhouse..... | 3½ |
| Davis-Daly..... | 47½ | Nipissing..... | 10 13-16 |
| Dolores..... | 6 15-16 | Ohio Copper..... | 5¾ |
| El Rayo..... | 2¾ | Ray Central..... | 2 5-16 |
| Ely Central..... | 1 5-16 | Ray Con..... | 22¾ |
| First National..... | 6 11-16 | Superior & Pittsburg..... | 15½ |
| Giroux..... | 8 15-16 | Tenn. Copper..... | 39¾ |
| Guanajuato Con..... | 17½ | Trinity..... | 10 7-16 |
| Inspiration..... | 7 5-16 | Tuolumne Copper..... | 3 7-16 |
| Kerr Lake..... | 7½ | United Copper..... | 7 9-16 |
| La Rose..... | 4 11-16 | Utah Copper..... | 59½ |
| Mason Valley..... | 1 13-16 | Yukon Gold..... | 5 |

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

CONVEYANCE OF MINERALS—CONSTRUCTION.

A bare conveyance of minerals does not create a special and distinct estate in a technical sense; it only separates a part of the property from the remainder and the right to ownership and control of such minerals is consistent with all other rights of ownership to the surface and other parts of the land. It accordingly follows that where a mineral which has been conveyed was removed from the land, the owner of the mineral ceased to have any further rights in such land. It is also the rule that a grantee of minerals has no way of necessity over the land of a stranger to remove such minerals.

McBurney v. Glenmary Coal & Coke Co. (Tenn.) 118 Southwest. 694, May '09.

CONVEYANCE OF A SPECIFIC MINERAL—EFFECT.

Where the owner of land conveys a particular mineral by a specific term, and not by a general term, the rule is that such particular mineral alone will pass, and that all other minerals remain as the property of the owner of the land.

McBurney v. Glenmary Coal & Coke Co. (Tenn.) 118 Southwest. 694, May '09.

POWER OF STATE TO REGULATE MINERAL SPRINGS.

A State under the doctrine of police powers may regulate the use of mineral and carbonic acid gas wells and prevent waste and detriment to neighboring proprietors who procure water and gas from the same source.

Hathorn v. National Carbonic Gas Co. (New York) 87 Northeast. 504, Feb. '09.

LOCATION OF MINE—QUALIFICATION OF LOCATOR.

The United States statutes prevented the officers, clerks, and employees of the General Land Office from purchasing or becoming interested in the purchase of any public lands. But where a person while competent to make a mineral location, did locate a mine with an excessive area, and thereafter changed the boundaries of his claim so as to exclude the point of discovery, and before making a new discovery within the readjusted boundaries, was appointed a deputy surveyor of the Land Department, his claim perfected by a new discovery after his appointment was void.

Waskey v. Hammer, 170 Fed. 31, May '09.

ADVERSE MINING CLAIMS—QUIETING TITLE.

A locator of a claim in a mining district where there may be extra-lateral rights existing in favor of those owning contiguous or neighboring claims, cannot compel them in an action brought by him to assert and make proof of such rights which might exist in their favor, and that a judgment in such an action by the locator cannot be exclusive as to the rights of the parties in the ownership of such extra-lateral rights; he cannot thereby cast the difficult and usually impossible burden upon the owners of adjoining claims, whom he may name as defendants in his action, to make immediate proof of their rights, whether they know the facts conferring such rights or not, and practically to assert adverse claims to a thing before they know it exists. It is only when a claim of an adverse estate or interest is made that the owner can avail himself of the statutory remedy for determining the title to adverse claims. If the owner's title to the surface of the mine as a whole is denied on the ground of alleged failure to take some steps essential to its acquisition, then the owner can resort to the statutory remedy and require all claimants to make good their adverse claims to such title or be forever barred from doing so. But whether a vein exists underneath the surface or whether it so dips and reaches its apex within the body of a claim owned by another is always purely conjectural until the facts are ascertained by discovery and development.

Keely v. Ophir Consolidated Min. Co., 169 Fed. 601, Apr. '09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

GEOLOGY AND ORE DEPOSITS OF GOLDFIELD, NEVADA. By F. L. Ransome, assisted in the field by W. H. Emmons and G. H. Garrey. U. S. Geol. Surv., Prof. Paper, 66. 251 pages, index, ill., maps. Washington, 1909.

The appearance of this report has been awaited with much interest. Copies were available early in October, although field work had continued into November 1908. This promptness in publication stands in welcome contrast to the past record of the Geological Survey. The report itself is not less welcome. Mr. Ransome has discussed in detail and with clear insight the geology of our great gold district and has done much to elucidate the complex problems of the genesis and distribution of the unique deposits. Aside from the local interest in the structure and extent of the deposits, attention centres naturally in what he has to say of the genesis of alunite and its association with gold. Alunite, the hydrous sulphate of potassium, is so abundant in the Goldfield district and so generally associated with intense alteration of the rocks in the vicinity of the ore deposits that it has come to be considered one of the most characteristic minerals and has given name to a new type of ore deposits, the alunite-gold type. Mr. Ransome abandons his earlier hypothesis, that the ore-depositing solutions may have come from below already charged with sulphuric acid, and considers two other hypotheses. (1) The alunization of the rocks of Goldfield may have been effected by cold sulphate solutions percolating generally downward in masses of oxidizing sulphides, principally pyrite. This is rejected on the basis of its quantitative insufficiency. (2) According to the third hypothesis, which is the one favored, the ore constituents were brought up in hot solutions charged with hydrogen sulphide, a little carbon dioxide and probably alkali sulphides; the hydrogen sulphide was oxidized at and near the surface to sulphuric acid which percolated down through the warm rocks to mingle with the rising currents carrying sulphuric acid; the precipitation of the richest ores took place in the zone where the two kinds of solutions mingled, and in consequence of such mingling. Space is not available to cite the evidence for and against this hypothesis. While it lacks demonstration, it seems well sustained. The report is a substantial contribution to the science of ore deposits and an excellent example of the good work the Geological Survey can do in aid of the mineral industry.

IRON ORE DEPOSITS ALONG THE OTTAWA (QUEBEC SIDE) AND GATINEAU RIVERS. By Fritz Cirkel. Canada, Dept. Mines, Mines Branch. Pp. 147, ill., index. Ottawa, 1909.

The publication of this report comes at an opportune time, owing to the development lately assumed by the smelting of iron ores by electricity. The region discussed possesses great water-powers, a part of which could well be applied to the establishment of an iron and steel industry. After describing in detail various iron ore deposits in the townships of Hull, Templeton, Wakefield, Bristol, Grenville, and others, Mr. Cirkel concludes that many of these would yield ores which could probably be treated profitably in the electric furnace. It is stated in the report that this method of reducing the iron ores can compete with the blast-furnace for the production of pig-iron, when electrical energy can be developed at a low cost. All engineers and metallurgists interested in the iron and steel industry will read the report with interest, more especially the general conclusions which are given from page 100 to page 107.

The Copper Combination.

The Boston News Bureau has prepared the figures quoted below, which, while of course entirely theoretical, present some interesting deductions based on the assumption that the profits of the various subsidiary properties on 13c. copper will be capitalized into 6% preferred stock, and that

this preferred stock will be worth \$90. This is reported to be the basis on which the merger is to be made. Figures are also shown representing the capitalization of the additional profits to be derived on 15c. copper into 4% common stock, and assuming that this common stock will be worth \$50.

In order that the figures below may be clearly understood, the way this theoretical proposition works out must be explained. Amalgamated, for instance, has 1,538,000 shares outstanding and has an ownership in about 205,000,000 lb. of annual copper output. This copper is being produced at an average cost of about 10c. per pound, and the profits on 13c. copper amount to \$6,150,000 per annum, or \$4 per share. The additional profits on 15c. copper amount to \$2.70 per share. If the 13c. copper profits are capitalized into 6% preferred stock, and this preferred stock is worth \$90, there results an equivalent value of \$59.50 per share to be received in new 6% preferred stock and a value of \$33.50 per share in new common stock, or a total of \$93 per share. Following this same line of reasoning, there works out a value of \$47 per share for Anaconda, 84½ for North Butte, 25½ for Butte Coalition, 51½ for Utah Consolidated, 80 for Utah Copper, 30 for Nevada Consolidated, 14 for Greene-Cananea, 13½ for Superior & Pittsburg, and 119 for Calumet & Arizona.

The figures take into consideration only the present earnings of the various subsidiary properties. They do not take into consideration, as in the case of Amalgamated, the value of its timber and coal lands, and neither do the figures take any account of the great differences which exist with respect to the ore reserves of the various properties. These are all matters which will have to be worked out in conference, and explain, in some degree, why it is needless to expect an immediate announcement of any final determination as to the prices at which the various properties will enter the combine. North Butte, Butte Coalition, and Superior & Pittsburg have nothing to show in the way of smelter assets, and the companies possessing their own railroads, mills, and smelters must receive proper compensation therefor. The deductions below take consideration of earning power only; the question of property assets is a matter for future adjustment.

The following figures deal with the various producing properties to be embraced in the new company. In all of the companies treated, save the Utah Consolidated, the effort has been to indicate production close to current output. The Utah Consolidated property, however, is producing at the present time about 10,000,000 lb. of copper only, but as it expects soon after the first of the year to have its ore treated at the new smelter of the International Smelting & Refining Co., 16,000,000 lb. has been assumed as the yearly output. This is somewhat below the expectation of the company when the new smelter is in regular operation.

| | Shares. | Production, lb. | Cost, per lb. | Profits on 13c. copper. | Total value per share |
|----------------------|-----------|-----------------|---------------------|-------------------------|-----------------------|
| Amalgamated | 1,538,000 | 205,000,000 | \$0.10 | \$6,150,000 | 93 |
| Anaconda | 1,200,000 | 86,000,000 | 0.10 ¼ | 2,400,000 | 47 ½ |
| North Butte | 400,000 | 40,000,000 | 0.09 | 1,600,000 | 84 ½ |
| Butte Coalition | 1,000,000 | 38,000,000 | 0.10 | 1,140,000 | 25 ½ |
| Utah Consolidated | 300,000 | 16,000,000 | 0.08 | 800,000 | 51 |
| Utah Copper | 725,000 | 60,000,000 | 0.08 | 3,000,000 | 80 |
| Nevada Consolidated | 2,000,000 | 60,000,000 | 0.08 | 3,000,000 | 30 |
| Greene-Cananea | 2,325,000 | 45,000,000 | 0.10 | 1,350,000 | 14 |
| Superior & Pittsburg | 1,500,000 | 25,000,000 | 0.09 | 1,000,000 | 13 ½ |
| Calumet & Arizona | 200,000 | 28,000,000 | 0.09 | 1,120,000 | 119 |
| | | | 6% pfd. stock at 90 | 4% com. stock at 50 | |
| Amalgamated | \$4.00 | \$2.70 | 59 ½ | 33 ½ | 93 |
| Anaconda | 2.00 | 1.40 | 29 ½ | 17 ½ | 47 ½ |
| North Butte | 4.00 | 2.00 | 59 ½ | 25 | 84 ½ |
| Butte Coalition | 1.14 | 0.76 | 17 | 8 ½ | 25 ½ |
| Utah Consolidated | 2.60 | 1.06 | 38 ½ | 13 | 51 |
| Utah Copper | 4.00 | 1.65 | 59 ½ | 20 ½ | 80 |
| Nevada Consolidated | 1.50 | 0.60 | 22 ½ | 7 ½ | 30 |
| Greene-Cananea | 0.60 | 0.40 | 9 | 5 | 14 |
| Superior & Pittsburg | 0.65 | 0.34 | 9 ½ | 4 | 13 ½ |
| Calumet & Arizona | 5.60 | 2.80 | 84 | 35 | 119 |

Production of Gold and Silver in the United States for the Calendar Year 1908.

The United States Geological Survey and the Bureau of the Mint, acting in co-operation in the examination and analysis of reports from private refineries and records of Federal mints and assay offices, have determined the finished product from domestic mines in 1908 to have been as given below. The unusual delay in furnishing these figures this year has been caused by wholly unlooked-for difficulties in adjusting the data furnished. The product of gold was 4,574,340 fine ounces valued at \$94,560,000, and the production of silver was 52,440,800 fine ounces, with the commercial value (at the average price for the year) of \$28,050,600. As compared with the figures for 1907 the above shows an increase in the gold product of \$4,124,300 and a decrease in the silver product of 4,073,900 fine ounces. Of the 23 States and Territories producing gold, 9 show an increase of production, while 14 show a decrease. Of the 26 States and Territories producing silver, 13 show an increase and 13 a decrease.

| State or Territory. | Gold | | Silver | |
|---------------------|-----------|------------|------------|------------|
| | Fine oz. | Value. | Fine oz. | Com'l val. |
| Alabama | 1,993 | \$ 41,200 | 400 | \$ 200 |
| Alaska | 960,669 | 19,858,800 | 204,600 | 109,400 |
| Arizona | 120,937 | 2,500,000 | 2,900,000 | 1,551,200 |
| California | 935,074 | 19,329,700 | 1,703,700 | 911,200 |
| Colorado | 1,106,385 | 22,871,000 | 10,150,200 | 5,429,400 |
| Georgia | 2,719 | 56,200 | 200 | 100 |
| Idaho | 69,829 | 1,443,500 | 7,558,300 | 4,042,900 |
| Illinois | | | 2,000 | 1,100 |
| Michigan | | | 294,100 | 157,300 |
| Missouri | | | 49,400 | 26,400 |
| Montana | 152,865 | 3,160,000 | 10,356,200 | 5,539,500 |
| Nevada | 565,475 | 11,689,400 | 9,508,500 | 5,086,100 |
| New Hampshire | 179 | 3,700 | 6,300 | 3,400 |
| New Mexico | 14,817 | 306,300 | 400,900 | 214,500 |
| North Carolina | 4,716 | 97,500 | 1,300 | 700 |
| Oregon | 43,823 | 905,900 | 56,100 | 30,000 |
| Philippine Islands | 13,763 | 284,500 | 1,300 | 700 |
| Porto Rico | 29 | 600 | | |
| South Carolina | 2,578 | 53,700 | 200 | 100 |
| South Dakota | 374,529 | 7,742,200 | 197,300 | 105,500 |
| Tennessee | 179 | 3,700 | 60,900 | 32,600 |
| Texas | 24 | 500 | 447,000 | 239,100 |
| Utah | 190,922 | 3,946,700 | 8,451,300 | 4,520,600 |
| Virginia | 174 | 3,600 | 300 | 200 |
| Washington | 12,273 | 253,700 | 86,800 | 46,400 |
| Wyoming | 368 | 7,600 | 3,500 | 1,900 |

Total4,574,340 \$94,560,000 52,440,800 \$28,050,600

The commercial value of fine silver in 1908 averaged \$0.5349 per ounce.

Copper Prices.

That copper will go to 16c. by Christmas is generally anticipated in the copper trade, and there is every indication that prices between now and the end of the year will be materially higher. Consumers who were skeptical when the metal was hanging dull at 12¾ to 13c. and refused to buy more than actual requirements for a short period will probably be obliged to pay 1½ to 2c. above what they could have secured the copper for a few weeks ago. The United Metals Selling Co. has been naming 13¾c. for electrolytic brands. Sales of Lake copper at 14c., 30 days, represent the best figure for months. There is a good demand for this brand, and with Calumet & Hecla out of the market there appears a better chance for the smaller producers to get top prices. Middle Western manufacturers who are large consumers of Michigan copper have been anxious buyers recently. When the Metals Selling Co. put its price up to 13½c. it began to book January contracts in large volume, and its current advance to 13¾c. indicates its willingness to consider February business.—Boston News Bureau.

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TABLE OF CONTENTS.

EDITORIAL:

| | |
|--|-----|
| Notes | 811 |
| Geology as She Is Wrote..... | 812 |
| Pan-Americanism | 812 |
| Conservation and Alaskan Coal Lands..... | 813 |
| Qualified Engineers | 813 |

ARTICLES:

| | |
|--|-----|
| Tests on Acid Regeneration of Cyanide Solutions | |
|R. P. Wheelock | 814 |
| Conservation and Some Difficulties..... | |
|Horace V. Winchell | 819 |
| Bannock, Nevada..... | |
|Charles S. Thomas | 820 |
| Development at the Esperanza Mine, El Oro, Mexico | |
|W. E. Hindry | 822 |
| Goldfield Mill Improvements | |
|Our Special Correspondent | 825 |
| Mica Deposits of South Dakota..... | |
| Douglas B. Sterrett | 826 |
| Silver, Copper, Lead, and Zinc in the Central States | |
| in 1908 | 842 |
| Platinum Production in 1908..... | 842 |

DISCUSSION:

| | |
|-----------------------|-----|
| A Correction | |
| W. H. Storms | 828 |
| Miners' Unions | |
| Observer | 828 |
| Pan-Americanism | |
| Lee Fraser | 829 |

CONCENTRATES

SPECIAL CORRESPONDENCE

GENERAL MINING NEWS

DEPARTMENTS:

| | |
|-----------------------------|-----|
| Personal | 840 |
| Market Reports | 840 |
| Publications Received | 841 |
| Commercial Paragraphs | 842 |
| Dividends | 842 |
| Catalogues Received | 842 |

EDITORIAL.

MINING machinery for initial plant on a mining property formerly could be entered free of duty into Mexico. The rebate, however, is no longer allowed except by special concession from the Minister of Fomento. There is no difficulty in obtaining this where the case is genuine and not a mere attempt at evasion of customs duties. The present Minister of Fomento, Mr. Olegario Molina, is a liberal gentleman, zealous in the promotion of the mining interests of the country, equally when controlled by foreigners as when owned by Mexicans.

BUTTE is awakening to a renewed interest in politics. The theatric welcome extended to Mr. F. A. Heinze on his recent visit is said now to have been carefully staged with one eye on the prosecuting attorney in New York and the other on the plain voters of Montana. Just what is up is uncertain, but there are rumors of an effort on Mr. Heinze's part to re-elect Mr. W. A. Clark to the Senate in the place of Mr. T. H. Carter. We hope this does not mean a recurrence of the nasty fighting that so long disgraced the politics and government of that great State.

VICTIMS to carelessness in the handling of explosives multiply. Treacherous powders are practically unknown today. Spontaneous combustion is so rare as to offer a feeble and scarcely credible excuse for accidents. But as Lieutenant Walke dryly remarked, "the function of an explosive is to explode." If men will insist on tamping powder with an iron bar they must expect to strike fire and pay a heavy penalty. The accident in the Keystone mine, Amador county, California, noted in our news department this week, gives emphasis to our comment.

SAN FRANCISCO has decided to celebrate the opening of the Panama Canal in 1915 by a world's fair to be called the Panama-Pacific Exposition. An organization has been effected, and invitations have been extended to foreign countries to participate. The fair will undoubtedly be one of the most notable ever held. Aside from the customary features of such an enterprise, the Spanish note will be strongly sounded. California harks back to Spanish beginnings; her recent celebration of recovery from the disaster of 1906 was made to turn upon a point in history which linked the name of Gaspar de Portolá with San Francisco Bay. The opening of the Panama Canal, which will mark the commencement of a new era for the West Coast States, will occur, it so happens, almost exactly on the fourth centennial of the discovery of the Pacific by Vasco

Nuñez de Balboa. From the summit of the low range of hills on the Isthmus of Panama, September 26, 1513, the great ocean was first seen by the Spanish conquistador, and there was first dreamed the hope of cutting the narrow neck of land which barred the passage to the Indies. In a peculiar way this exposition will call attention also to the days of the Argonauts, and the early glory of Californian gold mining. This will re-awaken interest in the possibilities which remain of creating great mining enterprises along the Mother Lode and northern Gold Belt. There is no other place where so many opportunities for profitable gold mining lie neglected as in the foothills of the Sierra Nevada.

Geology as She Is Wrote.

What a man knows he can explain lucidly. One who is master of a subject can make it clear to the ordinary intelligence, even though the matter be recondite. One kind of knowledge is as difficult as another, and no more so. It is a question of thoroughly comprehending every antecedent fact and circumstance. Those being known the mysteries disappear, and all is as simple as that two and two make four. The example of 'geology as she is wrote' which we quote below carries with it a warning to engineers. It is an example of deficient training in one of the fundamental sciences by the application of which, in part, the mining engineer earns his bread and butter; and it also illustrates the helplessness of a mind untrained in the technique of expression.

"I am free to confess that under normal conditions the appearance and mineralization of the ore shoot on the 7th level, supposing it to be the deepest development at the time of my examination, would offer little encouragement for the future of the mine with deeper development, but in view of Mr. K——'s statement as to the conditions on the 8th level and in view of the great movements which seem to have recurred at various intervals even after the depositions the appearance and mineralization of the ore shoot on the 7th level which is a frequent and to be expected occurrence in any ore deposit, it seems from the number of faults, both longitudinal and transverse, that there have been a number of periods of elevation and subsidence of one or both sides of the fault, so if the present 7th level might have at one time represented the depth to which secondary enrichment reached at one period, or the then ground water level, subsequent elevation of the country may have lowered the water level and thus have extended the secondary enrichment to greater depth, and this may have been done through successive periods and finally the whole may have subsided below the present permanent water level, and thus the future prospects of the mine with depth may be very much extended."

The above is not from a romance written by a quack for a set of wild-cat promoters, but is taken verbatim from a serious report to one of the most prominent companies in the United States by an engineer of wide reputation. The brain grows dizzy in attempting to follow the fearful oscillations, sub-

sidences, and elevations that seem "upsetting the stability of the earth alternately on one and the other side of the numerous faults. The ebb and flow of the ground-waters washing that copper 'reef' must indeed have produced appalling changes. Might not so bewildered an engineer have done quite as well to have stood safely on the apex, singing "what are the wild waves saying?"

Pan-Americanism.

Pan-Americanism, as discussed by Mr. Lee Fraser elsewhere in this issue, calls renewed attention to a growing misconception among Latin-Americans of the attitude of the United States toward expansion. That such a sentiment should be encouraged by commercial rivals is natural. At the present moment the purposes of the Government with regard to Nicaragua are being watched with anxiety. The development of mines in Spanish America is one of the most promising opportunities now lying open to our capitalists, and the good-will of the local governments and of the people counts heavily. That the sentiment against further territorial aggrandizement is dominant in this country is indubitable. It is only when goaded on by the jingoes that a contrary disposition becomes manifest. In fact, even under such stimulus, no absorption of territory has taken place except as an accident of war. The United States embarked upon the Spanish-American war fully pledged not to acquire territory. This was with an eye to Cuba, other possibilities being lost sight of at the moment. With respect to Cuba absolute faith has been kept. A more tender regard for autonomy would be hard to duplicate, for the vested interests of Americans in that island are so great that incentives to annexation were strong. *A de facto* government existed in Cuba, and had proved itself competent to withstand the power of Spain. No such condition obtained in Porto Rico or in the Philippines. Those dependencies fell under American guardianship, and no one can certainly foretell what their ultimate status may become. They were assuredly not annexed with any desire to increase American possessions, and the fact that such a spirit does not animate this country is further evidenced by the recognition of independence on the part of Panama, where, if ever, there was some excuse for assuming control of the territory. Restraint in this particular should redound to our credit as a nation.

It is to be hoped that the United States will not commit the tactical blunder of assuming a protectorate over Nicaragua, nor of attempting joint control with Mexico. Protection of the life and interests of American citizens in the customary way, without vociferation and moral disquisitions, but swiftly and decisively, by force of arms if need be, will promote the development of responsible government in Central America. A country held to accountability as a member of the family of nations is more useful than one which is denied the means of growth through independence. Furthermore, it is well to bear in mind that the foreigner has largely fostered corrupt government in these petty republics. Under an honest administration the granting of monopolies

and princely concessions would cease. The quest of such prizes is the basis for a large amount of the graft prevalent in Central America; it is also the cause of friction, leading to revolutions. These are usually set in motion for the benefit of foreign interests. The answer of President Zelaya to the letter of Secretary Knox, requesting that a commission be sent to investigate affairs in Nicaragua, was a diplomatic move, and the silence at Washington regarding this proposal is significant.

Conservation and Alaskan Coal Lands.

In another column of this issue Mr. Horace V. Winchell calls attention strikingly to some of the complications that have arisen recently as a result of the conservation policy applied to the public lands. Mr. Winchell is evidently finely indignant and quite worked up through sympathy for the poor widow zealously guarding her six trees on the bleak Dakota prairie. We fancy we discover in her at least a family resemblance to that other well known widow whose duty in life it is to come out and cry publicly wherever an attempt is made to regulate the affairs of corporations—but that is aside from the main point; one which Mr. Winchell very properly makes.

There can be no retroactive legislation in the United States, nor can administrative process supersede Statute law. However much we may regret in a particular case that the conservation policy was not sooner adopted or that it has not yet been written into the law, the fact is that the law, as it now stands, must be obeyed. If there are disagreements as to its interpretation or as to the facts of the case, it is for the courts to decide. Any attempts to evade or nullify the law are, at least, as unfortunate when undertaken by Government officers as when by corporations. We heartily subscribe to Mr. Gifford Pinchot's dictum that a public officer should go just as far as the law permits rather than commands, in protecting the public interest; but he should not go farther.

In the cases of the Alaskan coal lands the facts seem to be that the United States coal land laws were extended to that territory in 1904. Numerous claims were promptly taken up under the law. They were at once attacked as fraudulent, and no patents have been allowed. Many such cases are now pending. In the meantime industrial development in the region affected has undoubtedly failed to come as rapidly as was anticipated, and this uncertainty as to title is manifestly one cause. In an attempt to remedy matters Congress passed supplementary legislation designed to allow under the new law, which provided for enlarged claims, patents on land entered "in good faith" under the old statute. Incidentally the new law includes rigid restrictions against consolidation of claims in the interest of monopoly. The coal land claimants have refused to accept the new law, and have preferred, as is clearly their right, to stand on the law as it existed when they took up the land. They have stoutly maintained that their claims were not fraudulently entered. This seems to us properly a case for judicial decision, and whether the poor prospector or the rich Guggenheims

be the real parties in interest, has nothing to do with that fact. We have assurances, which we are bound to respect, to the effect that certain of the most famous claims at least, are not now and never have been owned by the Guggenheims but are in fact, as alleged, the property of the claimants in interest. It is none the less probable that if the claims be confirmed there will be a market for them with the interests now building railroads in the vicinity. At least that has been the universal history in the States. The railroads, for their own protection as well as to stimulate traffic, must and do become heavy owners of coal properties. This entails much incidental hardship as well as benefits. Neither the matter of relations of railroads to coal land, nor questions of monopoly have anything to do, however, with whether the coal land claimants in Alaska are entitled to what they ask. This is a question of law and evidence and should be decided as such. There should be some limit established beyond which the Land Office could not hold up a claim, or the right of mandamus should be given the claimant. The American people cannot afford to be unjust, no matter how worthy the motive.

Qualified Engineers.

Fixing a grade for mining engineers as a license to practice has been frequently discussed in these columns, editorially and by correspondents. The subject was reviewed last week by Mr. John M. Nicol, who sees in the proposed Bureau of Mines a possible means of carrying into effect some scheme for determining who may and who may not exercise the functions of a mining engineer. Mr. Nicol, writing from the political focus of a strongly centralized government, has overlooked the fact of jealously guarded 'States rights' in this country. A plan which might be feasible under the Mexican system would not be possible here. Each State has authority over the licensing of men to perform the duties of any trade or profession. These matters fall under the head of police regulations. The only excuse which could be offered for interfering with the free activities of a man choosing to do mine-engineering work lies in the protection of the lives and property of other people. Such restriction may be set by the State; under no circumstances can this right be arrogated by the Federal Government.

Licenses are granted to physicians and to lawyers, after examination. No question of university degrees arises. The fact to be determined is the fitness of the man for the work he proposes to do. It matters not how he acquired his knowledge. Up to the present time no such restrictions have been imposed upon any of the professions as safeguard the charmed group of doctors and lawyers who have passed their examinations. Any man can be his own physician; he may plead his own cause before judge and jury; but he may not serve another without license. The time will come, no doubt, when mining engineers, together with civil, mechanical, electrical engineers, and architects, will come under the scrutiny of the State, for the protection of both the public and the professions from the evils of unqualified practitioners.

TESTS ON ACID REGENERATION OF CYANIDE SOLUTIONS.

Written for the MINING AND SCIENTIFIC PRESS
By R. P. WHELOCK.

An opportunity was recently presented to make an investigation of the cyanide treatment at a certain plant with the object of decreasing the cyanide consumption. Because of limited time and facilities, exhaustive analyses were impossible, consequently the results obtained are not as conclusive as might be desired. The plant mentioned was designed primarily for the treatment, by leaching, of the coarser portion of a roughly sized accumulation of mill tailing. Though rated at 150 tons daily capacity, it has, under the most favorable conditions, an estimated daily capacity of 145 tons, allowing five days for total treatment. Its chief features are five 150-ton leaching vats (loaded and unloaded with the aid of belt-conveyors), from which the gold-bearing solution flows through one of two small distributing tanks to one or more of four 5-compartment zinc-boxes, thence to the storage-sumps, where it is built up with cyanide as desired and returned to the leaching vats by means of a centrifugal pump.

It has been customary to pass from 300 to 500 tons of solution through each charge during its course of treatment, the amount being governed chiefly by the rate of percolation. Starting with a solution containing 5 lb. of KCy per ton, the strength is gradually decreased to 2 lb. in the succeeding solutions and this, on the last day, is followed by a wash of from 20 to 30 tons of water. A vacuum-pump assists in draining the vat. The tailing discharged contains about 20% moisture. Sodium cyanide is used exclusively, but all cyanide contents are noted in terms of 100% KCy. All titrations for free cyanide during these experiments, were made by Liebig's method, using silver nitrate and potassium iodide for an indicator, and titrations for protective alkali were made with a sulphuric acid solution and phenol phthalein after the addition of silver nitrate. For the sake of later brevity, we will also state that the results of titrations for free cyanide and protective alkalinity are given in pounds of potassium cyanide and calcium hydrate respectively per ton of solution.

At the time these investigations were undertaken, the cyanide consumption had increased to about 5 lb. KCy per ton of ore. Preliminary experiments, while not exhaustive as to the cyanicides present in the ore treated, had demonstrated that copper was the chief one and that its compounds soluble in cyanide solution were probably present in sufficient quantity to account for the loss of cyanide in treatment. After six months' operation of the plant, a number of determinations of the working solutions showed from 0.45 to 0.50% copper. Assays during the succeeding six months, and at the time when these tests were made, gave the same range. An average sample of the tailing being treated showed 0.61% copper. This copper occurs mainly as chrysocolla, malachite, and chalcocite. Lead is also present as galena, cerussite, and wulfenite. Merely to satisfy curiosity, rough tests were made to determine the relative

effects of these minerals upon a cyanide solution. A picked sample of each mineral was taken from the ore-bins and crushed to pass an 80-mesh screen. One hundred grams of each pulp-sample was treated with 250 c.c. of an 8.55-lb. KCy solution for 24 hours in a 300-c.c. bottle. The bottles were frequently shaken. While the manner of preparing the samples precluded the possibility of their being free from foreign cyanicides, yet the results seemed sufficiently marked to make them worthy of passing mention. The copper assays of each sample, and the cyanide titrations of the solutions at the end of 24 hours follow:

| | KCy, lb. | Copper, % |
|-------------------|-------------|--------------|
| Chrysocolla | 0.033 | 35.90 |
| Malachite | Trace | 64.90* |
| Chalcocite | Trace | 44.65 |
| Galena | 2.70 | 1.45 |
| Cerussite | 3.05 | 0.85 |
| Wulfenite | 8.30 | Trace |

*Probably mixed with some chalcocite.

Another sample of 100 gm. of malachite was taken and treated with 250 c.c. of water in which was dissolved 108.14 gm. KCy. After 12 hours, a consumption of 96.89 gm. KCy was indicated. Considerations which it is unnecessary to detail rendered it inexpedient to attempt the removal of the copper before cyanide treatment, and, to me, the most obvious alternative was the precipitation of the copper held in solution, and the liberation of its combined cyanide, if possible. It was known that upon the addition of acid to a cyanide solution containing double cyanides of the heavy metals with the alkali metals, most of the heavy metals are precipitated as cyanides. In the case of copper the reaction is probably,



Julian and Smart, speaking of the dissociation of cyanogen, even by weak acids, state: "If, however, the acid is dilute, * * * the action (of acid upon cyanide) is similar to that which occurs with water, thus,



In very dilute solutions the HCy escapes into the air so slowly that even some hours after the solution became acid practically the whole of the HCy is still present, and if alkali is added it will be found that the solution has lost little of its original strength. Some HCyO and KCyO is also formed in the presence of dissolved air."

With these statements in mind, I first determined the approximate amount of acid required to produce as complete precipitation as possible, using for the purpose 500 c.c. of a representative sample of the cyanide sump-solutions containing 2.2 lb. KCy, 1.5 lb. Ca(OH)₂, and 0.48% Cu. To this was added, 1 c.c. at a time, a 50% solution of sulphuric acid. A heavy white precipitate was produced which settled rapidly, leaving a clear solution. At frequent intervals small filtered portions of the solution were tested with a drop of the dilute acid until 15 c.c. of the acid had been added to the original 500 c.c. of KCy solution, when it was found that no further precipitate was produced. Five cubic centimetres of concentrated sulphuric acid were added

to 250 c.c. of the working cyanide solution, which titrated 1.3 lb. KCy and 0.7 lb. $\text{Ca}(\text{OH})_2$. After allowing a few minutes for the precipitate to settle, 10 gm. CaO were added, and the mixture stirred. The presence of undissolved CaO rendered it impossible to tell whether the original precipitate was re-dissolved, or a further precipitate produced. A titration gave 0.1 lb. KCy and 6.7 lb. $\text{Ca}(\text{OH})_2$, the $\text{Ca}(\text{OH})_2$ titration being of small value, however, on account of the indeterminate amount of lime in suspension. Later tests, in which sodium hydrate solution or lime-water were used instead of solid CaO , showed that the precipitate resulting from the addition of acid was re-dissolved, and a loss of free cyanide was shown in each case, undoubtedly due to the loss of HCy during the manipulation of the acidified solution. A 1000-c.c. sample was taken from the storage sumps. Titrations showed 1.4 lb. KCy and 0.7 lb. $\text{Ca}(\text{OH})_2$. To this were added 15 c.c. concentrated H_2SO_4 , and the solution agitated just sufficiently to secure a homogeneous mixture. This was immediately filtered into a beaker containing 200 c.c. of saturated lime-water. A titration showed 12.5 lb. KCy. Allowing for the increase in volume due to the addition of the lime-water, the result was 15 lb. KCy. A number of experiments on the same scale, using either solid CaO or lime-water, confirmed this result, the titrations varying from 14.9 to 15.3 lb. KCy, after making necessary corrections for dilution.

It now seemed expedient to make a test upon a somewhat larger scale, and for the purpose an empty cyanide case, approximately 21 in. square and 12 in. deep, was secured. In this was placed 160 lb. of the working cyanide solution, containing 1.5 lb. KCy, and 1.5 lb. $\text{Ca}(\text{OH})_2$ per ton, 0.46% copper, and a trace of gold. To this was added 2.5 lb. of commercial sulphuric acid. The usual heavy white precipitate was allowed to settle. Some gas was evolved, making it necessary to stir the top of the solution in order to facilitate the settlement of a portion of the precipitate which entangled gas-bubbles rendered buoyant. Otherwise the precipitate settled rapidly, and the resultant solution was quite clear. After one-half hour, the supernatant liquid was decanted into another cyanide case containing 7 lb. of commercial CaO , which was frequently stirred during the decantation. At the end of another half hour, a sample taken for titration showed 16.3 lb. KCy. After the lapse of three hours, titrations gave 15.6 lb. KCy and 2 lb. $\text{Ca}(\text{OH})_2$.

For the purpose of determining the permanency of the cyanide content, the solution was allowed to stand several days. After 24 hr. the result of a titration was 15.6 lb. KCy, and after 48 hr., 15.7 lb. KCy and 2 lb. $\text{Ca}(\text{OH})_2$. After having stood for 10 days another titration was made, and showed 20 lb. KCy, the increase in value being due to the fact that approximately one-quarter of the solution had evaporated. The precipitate from this test was collected, dried, and weighed, as a check upon the precipitation of the copper. The drying being conducted rather crudely, resulted in the decomposition of a small portion of the precipitate; consequently the assays are of no value for the determination of its

percentage composition, though they serve for the check mentioned. The weight, as dried, was 1 lb., and the assays were, gold, 0.09 oz. per ton; silver, 0.21 oz.; copper, 68.15%. In the original, 160 lb. of solution at 0.46 copper, there was 0.736 lb. of copper. The precipitate at 68.15% contained 0.6815 lb. copper, and the resultant regenerated solution 0.029%, or 0.0464 lb., a total of 0.728 lb. The copper in the regenerated solution was probably due to the re-dissolution of a small portion of the precipitate which passed into the lime receptacle during the process of decantation.

To determine the dissolving power of the regenerated solution, a test was made upon a sample of tailing. Four bell-jars were made to serve as shown in Fig. 1, which illustrates one of the two units of the apparatus employed. *A* is an inverted bell-jar to hold solution, fitted with a glass-tube and stop-cock *B*, which regulates the flow of solution into the bell-jar *C*. The latter contains a canvas bag *D* for holding the pulp under treatment, and to serve as a filter. *E* is a glass-tube and stop-cock for regulating the flow of solution from the jar *C*. *F* is a beaker to catch the solution. The solution collected in this beaker was poured back into jar *A* as desired. Of the tailing, two 5-lb. samples were taken. Lime was mixed with each sample in the proportion of 9 lb. per ton of ore, which was the amount regularly used in the large leaching vats. The samples, No. 1 and 2, were placed in bags *D* and *D'* respectively. Sample No. 1 was treated with a regenerated solution titrating 15.6 lb. KCy, but diluted with water to 5.05 lb, with 0.5 lb. $\text{Ca}(\text{OH})_2$. Sample No. 2 was treated with a portion of the working solution titrating 1.6 lb. KCy, but built up with cyanide to 5 lb., having 1.4 lb. $\text{Ca}(\text{OH})_2$; 2000 c.c. of solution were used in each case. The rate of flow was so regulated that this amount leached through the pulp about once every four hours. The subsequent titrations of samples of the two solutions are given below.

| | Solution No. 1. | | Solution No. 2. | |
|-------------------|-----------------|--------------------------------|-----------------|--------------------------------|
| | KCy, lb. | $\text{Ca}(\text{OH})_2$, lb. | KCy, lb. | $\text{Ca}(\text{OH})_2$, lb. |
| | per ton. | per ton. | per ton. | per ton. |
| At start | 5.05 | 0.50 | 5.00 | 1.40 |
| After 16 hours... | 3.35 | ... | 4.50 | ... |
| After 25 hours... | 2.35 | 0.25 | 3.20 | 0.25 |
| After 40 hours... | 1.70 | 0.20 | 2.25 | 0.20 |
| After 45 hours... | 1.20 | 0.20 | 2.00 | 0.15 |

After 45 hr., the solution was drained off and each sample was treated with 2000 c.c. of wash-water, which titrated KCy and $\text{Ca}(\text{OH})_2$ respectively for solution No. 1, 0.125 and 0.025, and for No. 2, 0.325 and 0.037 lb. per ton.

The gold and copper assays tabulated are as follows:

| Sample. | Before treatment. | | After treatment. | |
|-------------------|-------------------|-----------|------------------|-----------|
| | Gold, oz. | Copper, % | Gold, oz. | Copper, % |
| Heads of test.... | 0.13 | 0.6580 | .... | .... |
| Tailing No. 1.... | .... | .... | 0.040 | 0.6270 |
| Tailing No. 2.... | .... | .... | 0.040 | 0.6420 |
| Solution No. 1... | Trace | 0.0223 | 0.073 | 0.0573 |
| Solution No. 2... | Trace | 0.4640 | 0.057 | 0.4820 |
| Wash No. 1..... | .... | .... | 0.020 | .... |
| Wash No. 2..... | .... | .... | 0.026 | .... |

It was thought that possibly the alkalinity of the

solution used might have some bearing on the extraction and consumption of cyanide, consequently an attempt was made to secure appropriate data. A sample of tailing was secured which assayed 0.246 oz. gold per ton, 0.894 oz. silver, and 0.768% copper. The sample contained 11% moisture, but all assays are based upon the dry weight. Three portions, No. 1, 2, and 3, of 5 lb. each, undried weight, were taken, and to each portion was added 11.34 gm. CaO, equivalent to 10 lb. per ton. Three units of the leaching apparatus described in connection with the previous experiment were used, and samples No. 1, 2, and 3 were placed in jars O, C', and C'', respectively. Three solutions, No. 1, 2, and 3, were prepared.

Solution No. 1 consisted of regenerated cyanide solution at 19.2 lb. KCy. This was diluted to 4.5 lb. KCy, with 0.4 lb. Ca(OH)₂. The alkalinity was reduced by using H₂SO₄. Solution No. 2 was a portion of solution No. 1, diluted, with the alkalinity increased by the addition of CaO. Solution No. 3 was regular stock-solution, titrating 1.5 lb. KCy and 1.1 lb. Ca(OH)₂, built up with KCy and CaO. The final titrations and assays on the three foregoing solutions were:

| | KCy, lb. per ton. | Ca(OH) ₂ , lb. per ton. | Gold, oz. per ton. | Copper, % |
|------------|----------------------|---------------------------------------|-----------------------|--------------|
| No. 1..... | 4.35 | 0.1 | Trace | 0.0107 |
| No. 2..... | 4.55 | 4.0 | Trace | 0.0107 |
| No. 3..... | 4.85 | 1.9 | 0.016 | 0.3280 |

Samples No. 1, 2, and 3 were treated with 2000 c.c. each of solutions No. 1, 2, and 3, respectively, as in the previous test. The record of titrations and assays is as follows. After 4 hr., the solutions having leached through the pulp once:

| | KCy, lb. per ton. | Ca(OH) ₂ , lb. per ton. |
|------------|----------------------|---------------------------------------|
| No. 1..... | 2.00 | 1.0 |
| No. 2..... | 2.90 | 1.3 |
| No. 3..... | 3.85 | 1.9 |

After 17 hr., the solution having leached through twice:

| | KCy, lb. per ton. | Ca(OH) ₂ , lb. per ton. |
|------------|----------------------|---------------------------------------|
| No. 1..... | 1.3 | 1.0 |
| No. 2..... | 1.6 | 0.7 |
| No. 3..... | 2.6 | 1.3 |

At this point 1¼ lb. of the pulp was taken from each jar for assay, and a sample was also taken from each solution, sufficient to preserve the original ratio between the pulp and solution. The assays were as follows.

| | Pulp | | | Solution | |
|-----------|--------------|----------------|--------------|--------------|--------------|
| | Gold, oz. | Silver, oz. | Copper, % | Gold, oz. | Copper, % |
| No. 1.... | 0.130 | 0.710 | 0.689 | 0.143 | 0.0555 |
| No. 2.... | 0.100 | 0.720 | 0.627 | 0.133 | 0.0588 |
| No. 3.... | 0.135 | 0.785 | 0.627 | 0.093 | 0.3478 |

The treatment was continued with the remainder

of the pulp solution. After 24 hr., the solution having leached through three times, the titrations were as follows:

| | KCy, lb. per ton. | Ca(OH) ₂ , lb. per ton. |
|------------|----------------------|---------------------------------------|
| No. 1..... | 1.0 | 0.90 |
| No. 2..... | 1.5 | 0.75 |
| No. 3..... | 2.2 | 1.30 |

After 41 hr., the solution having leached through four times:

| | KCy, lb. per ton. | Ca(OH) ₂ , lb. per ton. |
|------------|----------------------|---------------------------------------|
| No. 1..... | 0.60 | 1.00 |
| No. 3..... | 1.25 | 0.75 |
| No. 2..... | 1.55 | 1.20 |

Solution assays at this point were:

| | Gold, oz. | Copper, % |
|------------|--------------|--------------|
| No. 1..... | 0.223 | 0.0630 |
| No. 2..... | 0.153 | 0.0672 |
| No. 3..... | 0.123 | 0.3783 |

The solution was drawn off and the pulp allowed to drain. Each sample was then washed with 1500 c.c. of water. Titrations and assays of wash-water were:

| | KCy, lb. per ton. | Ca(OH) ₂ , lb. per ton. | Gold, oz. |
|------------|----------------------|---------------------------------------|--------------|
| No. 1..... | 0.20 | 0.70 | 0.070 |
| No. 2..... | 0.25 | 0.25 | 0.063 |
| No. 3..... | 0.45 | 0.45 | 0.053 |

The assays of the pulp tailing of this test were:

| | Gold, oz. | Silver, oz. | Copper, % |
|------------|--------------|----------------|--------------|
| No. 1..... | 0.120 | 0.700 | 0.611 |
| No. 2..... | 0.115 | 0.685 | 0.595 |
| No. 3..... | 0.150 | 0.780 | 0.689 |

It was now decided to make a regeneration test upon a scale more nearly approaching that which would be required for the practical application of the method; consequently two tanks were arranged as shown in Fig. 2. Tank A had 17 tons capacity, and tank E 25. Three successive charges of solution were treated. For the first, 7.63 tons of old KCy solution was pumped into tank A at 1.9 lb. KCy, into 1.45 lb. Ca(OH)₂, assaying 0.02 oz. gold and

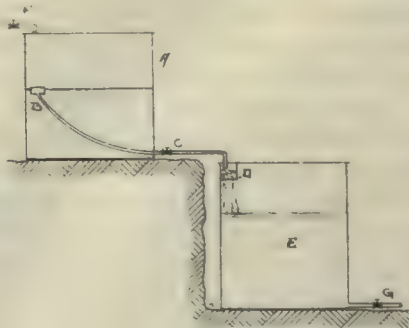


Fig. 2.

0.48% copper. Into this was stirred 202 lb. of commercial sulphuric acid. After the addition of the acid, two hours were allowed for the settlement of the precipitate, the top of the solution being stirred occasionally to facilitate the settling process. The solution was then decanted by means of the float-valve B through the box D into tank E. Lime was added to box D from time to time until the amount so added aggregated 190 lb. A titration of the re-

generated solution showed 8 lb. KCy and 0.75 lb. Ca(OH)_2 . It was found difficult to keep the decanted solution alkaline, the frequent addition of fresh lime to box *D*, and constant stirring, being necessary. A small sample taken from tank *A* before decantation, and made alkaline, gave 15.6 lb. KCy. A disagreeable odor was given off during the action of the acid on the cyanide solution, and the odor of HCy seemed to be distinguishable. The escaping gas had a tendency to produce headache. It was thought that considerable of the HCy must have escaped during decantation on account of the difference between the strength of the final regenerated solution (8 lb. KCy) and the strength obtained from the small test-sample (15.6 lb. KCy); consequently, for the second charge, the piping was changed slightly, a third tank was added, and a centrifugal pump was connected to the system as

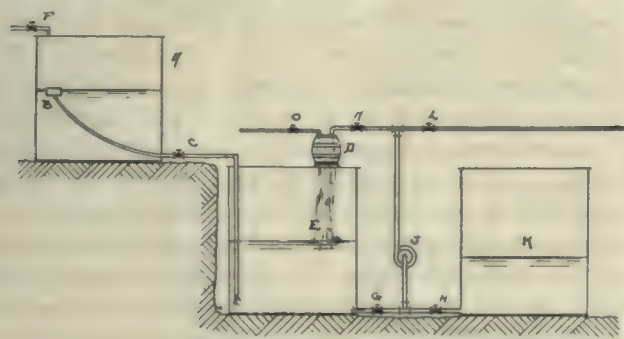


Fig. 3.

shown in the diagram, Fig. 3; 16 tons of old solution, titrating 1.65 lb. KCy and 1.65 lb. Ca(OH)_2 , and assaying 0.033 oz. gold and 0.48% copper was pumped into tank *A*. To this was added 498 lb. of commercial sulphuric acid. A small sample was taken after the addition of the acid. This was made alkaline with lime and titrated 15.8 lb. KCy. While the precipitate was settling, lime was added to the barrel *D*, and by means of the centrifugal pump the solution in the tank *E*, from the previous charge, was circulated through the barrel *D* until it was thoroughly saturated with lime. The solution from tank *A* was decanted into tank *E*. It will be noted that the discharge pipe from *A* was extended below the surface of the solution in *E* to prevent, so far as possible, the aeration of the acidified solution. During the decantation, water was run through the barrel *D*, to which lime was continually added. A total of 8½ tons of water, and 325 lb. of lime was used. As tank *E* became full, part of the solution was allowed to flow into tank *K*. The final product from the two charges was 13 tons at 9.2 lb. KCy in tank *K*, 16 tons at 7 lb. KCy in tank *E*, and 3 tons not decanted from tank *A*.

| | |
|--|----------|
| | KCy, lb. |
| 13 tons at 9.2 lb. KCy..... | 119.60 |
| 16 tons at 7.0 lb. KCy..... | 112.00 |
| | 231.60 |
| Less first charge, 7.63 tons at 8.0 lb. KCy..... | 61.04 |
| 13 tons from second charge..... | 170.56 |

This equals 13.12 lb. KCy per ton treated. After about 16 hr., the balance of the solution in tank *A* was decanted into a solution of lime and a titration

gave only 2.5 lb. KCy, after allowance had been made for the dilution. There had evidently been a considerable evolution of HCy from the acidified solution.

For the third charge, the arrangement of the apparatus used was the same as for the second charge. However, about three tons of the regenerated solution from the first two charges was left in tank *E*. Into this two tons of water was passed through barrel *D*, to which lime had been added. The result was five tons of a strong lime solution which titrated 6 lb. KCy. Fifteen tons of old cyanide solution titrating 1.65 lb. KCy and 1.65 lb. Ca(OH)_2 was pumped into tank *A*. This was treated with 418 lb. of commercial sulphuric acid. After settlement of the precipitate, 12 tons of the acidified solution was decanted into tank *E*. During the decantation, the solution in tank *E* was circulated through barrel *D*, into which fresh lime was frequently placed. The amount of lime added to this charge was 455 lb. A titration of the resultant solution gave 12.2 lb. KCy. Accounting for the dilution by the five tons at 6 lb. KCy, the 12 tons decanted from the acid tank, if undiluted, should have titrated 14.8 lb. KCy. It was now deemed advisable to test the dissolving power of the regenerated solution upon a working scale. One hundred and forty-five tons of tailing was charged into one of the regular leaching vats. The assay was 0.225 oz. gold per ton. During the charging, lime was mixed with the pulp to the amount of 9 lb. per ton.

There follows a record of the treatment of the tank for three days: First day, 9:45 a.m., pumped on 11 tons solution with 7 lb. KCy per ton, and 11 tons at 9.8 lb. KCy. In this solution I failed to secure the proper neutralization with the lime, consequently, after the addition of sufficient silver nitrate to combine with the free cyanide present, the solution did not show an alkaline reaction with phenol phthalein.

At 4:45 p.m., pumped on 10 tons of 9.8 lb. KCy and 12 tons of 11.7 lb. KCy solution; both of these had 0.2 lb. Ca(OH)_2 . The solution was allowed to stand in contact with the pulp until 7 a.m. of the next day. On the second day, 7 a.m., started leaching at the rate of about two tons per hour. The solution was allowed to flow through one 5-compartment zinc-box into a storage sump. The titrations and assays of samples taken at different times during the day are as follows:

| | | KCy, | Ca(OH)_2 , | Gold, | Copper, |
|------|----------------|--------------|---------------------|-------|---------|
| | | lb. per ton. | lb. per ton. | oz. | % |
| Vat | 7:30 a.m..... | 0.2 | 1.3 | 0.17 | 0.1440 |
| | 9:30 a.m..... | 0.3 | ... | .... | .... |
| | 10:30 a.m..... | Trace | 1.2 | 0.21 | 0.1442 |
| | 1:30 p.m..... | 0.05 | 1.5 | 0.21 | 0.1485 |
| | 4:30 p.m..... | 0.05 | 1.5 | 0.20 | 0.1461 |
| Sump | 7:30 a.m..... | ... | ... | 0.003 | .... |
| | 4:30 p.m..... | ... | ... | 0.007 | .... |

A boring sample of the vat, taken at 3:30 p.m., gave: sample unwashed, 0.11 oz. gold; sample washed with three charges of water, 0.09 oz. gold. A sample of the solution taken at 1:30 p.m. was regenerated in the laboratory with sulphuric acid and lime, and gave 4.4 lb. KCy. An assay of this regenerated solution showed a trace of gold, and 0.0047% copper.

Lack of sulphuric acid prevented the further treatment of this vat with regenerated solution; consequently at 4:30 p.m., 17 tons of solution from the storage sump, consisting of the solution previously used, and sufficient unused regenerated solution to give a strength of 3.3 lb. KCy and 1.6 lb. Ca(OH)₂ were pumped on the vat. This was allowed to leach slowly all night. At 7:30 the following morning the solution draining from the vat showed 0.05 lb. KCy and 1.8 lb. Ca(OH)₂, 0.25 oz. gold, and 0.2069% copper.

In an attempt to verify the suspicion that the HCy was rapidly lost upon exposure of the acidified solution, the following table was constructed:

| 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|-----------|-----------------------------------|------------------------|---------------------------|-----------------------|
| Acid. | Alkali. | After standing 12 hours. | | | |
| | | Immediate titration, lb. per ton. | Filtered, lb. per ton. | Un-filtered, lb. per ton. | On acid, lb. per ton. |
| Nitric | Lime | 9.2 | 20.5 | 18.5 | 0.3 |
| | NaOH ... | 17.7 | 17.7 | 18.3 | 0.3 |
| Hydrochloric | Lime | 17.5 | ... | 19.8 | 3.6 |
| | NaOH ... | 18.4 | 19.4 | 19.9 | 3.4 |
| Sulphuric | Lime | 15.6 | 17.6 | 16.2 | 0.5 |
| | NaOH ... | 13.3 | 14.6 | 16.2 | 0.5 |

Nitric, hydrochloric, and sulphuric acid was each used in turn as a precipitant, and with the acid, CaO and NaOH were employed to render the acidified solution alkaline, the acidified solution being allowed to filter into a beaker containing 50 gm. CaO or 5 gm. NaOH. The figures in the table represent KCy expressed in pounds per ton of solution. Column 1 shows the acid used. In each case 200 c.c. cyanide solution was treated with 5 c.c. acid. Column 2 shows the alkali used. Column 3 the acid precipitate, immediately filtered off with the least possible manipulation and agitation, the filtrate made alkaline, again filtered, and the second filtrate titrated. Column 4, the acid precipitate, immediately filtered off, the filtrate rendered alkaline, and after being filtered again allowed to stand 12 hr. before being titrated. Column 5, the acid precipitate, filtered off immediately and the filtrate rendered alkaline; the alkaline solution allowed to stand without a second filtering for 12 hr., and then filtered and titrated. Column 6, the unfiltered acidified solution, allowed to stand 12 hr. before the addition of the alkali, then rendered alkaline, filtered, and titrated.

Several tests were made with the precipitate obtained from the acid treatment, substantially as follows: the apparatus used was arranged as shown in Fig. 4. Twenty-five grams of the dried precipitate was placed in flask A. To this was added 50 c.c. water and 50 c.c. concentrated HCl. A cork was placed in the flask with tubing B leading to beaker C. In beaker C was placed 250 c.c. water in which was dissolved 10 gm. NaOH. The content of flask A was then heated to boiling. Titrations of the NaOH solution in beaker C were as shown in the table following.

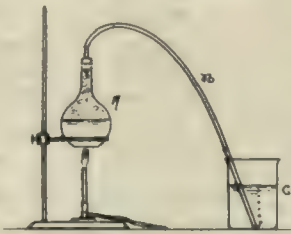
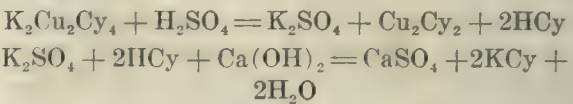


Fig. 4.

| | KCy, lb. per ton. |
|-------------------|-------------------|
| At start | ... |
| After ½ hour..... | 5.70 |
| After 1 hour..... | 78.75 |

The beaker was then removed, and after standing for 18 hr. a titration gave 79 lb. KCy.

In the foregoing notes, while copper, on account of its predominance, has been considered to the exclusion of other base metals, it is appreciated that there are others present in the solutions treated, notably zinc and lead. If the reactions in the case of copper are



for every pound of copper present there should be recovered 1.03 lb. KCy, consequently for a solution containing 0.5% copper, or 10 lb. per ton, there should be a recovery of 10.3 lb. Titrations of the regenerated solutions, however, frequently showed between 14 and 15 lb. in excess of the strength before treatment, during which it is probable that there were some losses. If one attempt to check the data given, there will be noticed a number of discrepancies, which probably are largely chargeable to experimental error, due to the crudity of the methods and apparatus employed and to failure to appreciate fully all the conditions governing the phenomena observed; yet the results seem to be sufficiently marked, and those of similar tests sufficiently in accord, to justify the conclusion that the process is feasible, and under proper conditions might be commercially profitable. Upon this point, criticism by those interested is desired.

Considering the last of the three tests with the apparatus shown in Fig. 3, the 15 tons of solution treated titrated originally 1.65 lb. KCy, and subsequently (with correction for dilution) 14.8 lb., a net gain of 12.15 per ton, amounting to 182.25 lb. of potassium cyanide, or 143.5 lb. of 127% sodium cyanide for the 15 tons. At 26c. per pound, this would be worth \$37.31. To recover this amount of cyanide, there was used 418 lb. of sulphuric acid at 3.5c. and 455 lb. of lime at 0.6c., a total of \$17.36. These figures show a profit of \$19.95, with no allowance for labor. As the whole operation required the services of but one attendant for a portion of a 3-hr. period, the labor cost was nominal. I also believe that the amount of acid and lime might have been reduced. In addition, there is the precipitate containing cuprous cyanide and probably cyanides of the other metals present in the solution. If the reactions given for copper, and similar reactions for the other cyanides hold good, the precipitate should contain an amount of cyanogen equal to that already released. It is possible to recover a large portion of this, at least, as shown by the last experiment described, though to determine the commercial practicability of the operation would require further investigation. The solutions best adapted to acid regeneration are those low in free cyanide and alkalinity, the precipitation of the dissolved metals as cyanides not commencing until after sufficient acid has been added to neutralize the solution.

CONSERVATION AND SOME DIFFICULTIES.

Written for the MINING AND SCIENTIFIC PRESS
By HORACE V. WINCHELL.

That the industrial development of the United States is one of the marvels of history is a boast of which we Americans are peculiarly proud. Other countries have progressed rapidly in all that makes for national greatness. Commerce has grown wonderfully in all quarters of the globe. The wealth of nations, as of individuals, has been accumulated with unexpected and most surprising rapidity. But in no other place has the rate of increase been so great and the aggregate result of prosperity, industry, and invention so astonishing, as in our own most fertile and richly endowed land. That we owe our position among the foremost nations of the world to the unprecedented liberality of our Government in the disposition of its agricultural and mineral lands for the benefit of all the people and the enrichment of the individual, is a proposition that will hardly be disputed.

Free homes for all who seek them, low-priced mineral, timber, stone, water power, and wealth of every description have been provided to all the world who chose to adopt our country as their own. Indeed, for many years it was our policy to seek immigrants and tempt them with offers of these attractions; the provisions of our laws amounted to an invitation to the settler and prospector to come hither and locate, to make discoveries of mines under the definite promise that they should receive patents therefor. There may be grave difference of opinion as to the advisability of such unrestricted gifts of our natural resources in perpetuity for the asking or mere discovery or improvement; but it was done, and the laws under which it was done are still in almost unmodified force and effect on our statute books; and it is certain that to this policy we owe in large part our leadership among nations today.

Recognizing the fact that our farms, lands, and coalfields are not unlimited, and mindful of the future, a step was taken by Mr. Roosevelt toward arousing public sentiment to such an extent that the laws might be changed and what remains in the possession of the general government reserved or sold under some arrangement which would prevent harmful monopolies and unrestricted corporation control. This movement, which should have been inaugurated years ago, was received with enthusiasm by the people, and pushed along so rapidly that the vehicle was soon ahead of the motive power. The more zealous of our public officials have been proceeding on the assumption that the proposed amendments to the law were already in effect. Such unauthorized action has already created serious trouble and will, unless discontinued, be followed by grave consequences.

The laws at present in force provide for the location of mining claims, for the taking of homesteads, for the sale of coal lands, at a certain price per acre, as has been the custom for many years past. Settlement is thus actually invited and title promised. But the practice is vastly different. If, for example, a poor widow takes up a homestead in North Dakota in ac-

cordance with the law she is at once termed a 'land-grabber', and is subjected to as much expense and indignity as though she were a thief. If there are half a dozen trees on her claim, there is an investigation by several special agents who report that she is endeavoring to procure a timber claim by homestead entry; and effort is made to still further embarrass her by the establishment of a forest reserve or the withdrawal of the land under the pretext that it may be at some time included in some tract that will be overflowed by some water-power scheme or within the limits of some irrigation project, all with entire disregard of the fact that she made her locations under the law prior to the establishment of any such reservations by the Government. If a prospector goes out year after year with his pack animal and outfit and finally fixes on a likely location he is at once branded as a suspect and would-be land-grabber. Emissaries of the forestry bureau 'geologists' of the land department and other \$80 per month employees of unknown (and unsuspected) accomplishments make it their business to see that the poor prospector is put to so much expense and trouble that he is either dead or 'busted' long before he gets the patent promised him by the very same government whose officious agents are now unlawfully opposing him. It is an actual fact that the Anaconda claim in Butte, which has produced untold millions of money in copper, gold, and silver, could not be patented under the rules and regulations now in force without a shaft several hundred feet in depth. Such expensive work is seldom within the resources of a prospector.

If a still more adventurous prospector goes into the unbroken wilderness of Alaska to make mining or coal locations he is either turned down with the statement that it does not matter what the laws are, his location cannot be accepted; or if he finally does get his filing on record he is then falsely placarded from one end of the country to the other as a tool of the iniquitous Guggenheims who are trying to take Alaska away from our dear Uncle Samuel. The charges that are then made against him may be as follows:

1. He is trying to secure by unlawful combination (probably because he has neighbors and is acquainted with them) coal land of incredible value.
2. The land is more valuable for timber than for coal.
3. There may be coal on it; but he has done nothing to prove it, beyond cutting a few miles of trails through the underbrush and digging a few test-pits on the outcrops.
4. In fact it is extremely doubtful whether there is any coal there whatever; and the Government in its wisdom and care for its subjects will protect them from the losses which they would suffer if they attempted to develop a coal mine where there is none. (Of course the Government does not offer to reimburse the prospector for the money he spent on the property, nor is it worth while to remember the few thousands of dollars which he paid into the treasury of the land department for his land at the price fixed by Congress for coal land in Alaska. That will be needed to pay the expenses of other

inspectors when they go up there to contest his neighbors.)

It is a significant fact that although there has been on the United States statute books for more than five years (since April 28, 1904) a law providing for the sale and patenting of coal lands in Alaska, yet there has not up to the present time been one single claim patented. The development of Alaska is not alone retarded; but the industries of the entire Pacific Coast have been asking for cheaper and better coal, which can come from no other place than Alaska. The Navy of the United States is and has been paying a high price for inferior coal on the Pacific; and the Geological Survey has repeatedly recommended the opening of Alaskan coal mines.

With the policy of conservation I am thoroughly and heartily in accord. That the natural wealth of our country should be so used as to last the longest and serve the greatest number, and that title to those natural resources which are everlasting should not be permanently surrendered to private ownership is only a statement of principle which has found expression on the statute books of most nations. But do not let us wrong ourselves and those who have already in good faith acquired rights based upon the laws in existence by upholding violations of those very laws. Having been reared in a land where respect for the law is in-bred let us not withhold our condemnation of those who seek to bring about reforms by premature distortion and over-riding of its plain provisions.

In the Hostotipaquillo district, State of Jalisco, Mexico, the greater part of the ores are found in quartz and contain silver in the form of sulphides, bromides, metallic silver and chlorides, gold, lead, iron (in various forms), and manganese, and in some cases traces of copper. The grade of these ores varies from 400 gm. to 50 kg. of silver per metric ton, some of them containing 3 gm. gold per kilogram of silver, little free-gold being found, as it is usually alloyed with the silver. The treatment of 1000 tons of ore, extracted from various mines, produced on the average \$4 in gold per ton. On trustworthy data one may count upon 2 to 4 gm. of gold per ton of ore, as the average product of all the mines. Up to the present time it has not been considered profitable to treat ores of lower grade than 1 kilo per ton and there are great bodies of ore that have not been touched, which yield from 400 to 600 grams.—*Mexican Mining Journal*.

A delicate qualitative test for zinc is described by Del Campo as follows: Add to an ammoniacal solution containing Zn, 1 c.c. of a 0.5% ether solution of resorcinol. A deep blue coloration develops at the line between the two layers of liquid, either immediately, or in a few minutes. If the proportion of Zn is small (0.005 milligram per cubic centimetre) it will not be perceptible before an hour has elapsed. Cd salts show a green color under these conditions. Cu salts give a black precipitate. In presence of Cu the test may be made for Zn by previously decolorizing by dilute KCy, of which no more than is absolutely necessary must be used.

BANNOCK, NEVADA.

Written for the MINING AND SCIENTIFIC PRESS
By CHARLES S. THOMAS.

Bannock is situated in Lander county, Nevada, about 14 miles southwest of Battle Mountain on the main line of the Southern Pacific railroad. Attention was attracted to it in August by discovery of unusually rich free gold in quartz by Alexander Walker, formerly of Cripple Creek, Colorado. Systematic prospecting had been going on in this vicinity in a quiet fashion for some time, but the discovery of the rich gold-bearing quartz apparently in an ore-shoot of some size, together with the prompt sale of the property to responsible Omaha investors, led to a rush to the district. The rich gold ore which was then discovered on the properties of the Nevada-Omaha Mining & Milling Co. occurs as quartz in, or along the walls of, a dike, very probably diabase, intrusive through altered rhyolite porphyry, carrying free gold. Free gold also is present here in the felsitic rock, though the occasional presence of crystal-line quartz may be noted.

In the accompanying figure, (2), I have designated these diabase dikes by the letter 'D'. The one at the extreme right of the picture is near the point where the discovery of gold was made. This figure, by the way, is explanatory of the geology of this district: AA shows the overlying basaltic rocks, 50 to 100 ft. in thickness and locally known as 'Malapai' or 'Malpais'. Underlying this is an altered rhyolite, BB, possibly intermixed with andesite or dacite. It is of unknown thickness and through it the later vein structure gave rise to a re-silicification of the fissure walls, forming what appears to be highly silicified or metamorphosed dikes, CC. There is also, a still further evidence of dike action in intrusive diabase (?), DD, along the fractures and walls of which the straight silicious and felsitic gold ores occur. The veins, CC, are composed of 'honeycombed' quartz, the interstices of which are filled with limonite pseudomorphic after pyrite, and containing gold and silver, principally the former, in varying amount. As far as developments have gone the ore rarely exceeds \$100 per ton in value. The 'Buzzard' mine, situated about two miles north by northwest of Bannock, is, I am informed on good authority, developing one of these oxidized veins and has been continuously mining and marketing ore of an average value of \$75 per ton for more than a year. Pannings made from the Old Iron mine, now embraced in the properties of the Nevada-Omaha Mining & Milling Co., and about 800 ft. north by northeast of the gold discovery above mentioned would fully bear out what is claimed for the Buzzard mine. The two are oxidized veins identical in character. These veins are well defined, within and along the silicified dikes (see Fig. 3), and traceable for miles, while the clear-cut walls speak volumes for their being the fillings of pre-existing true fissures. The diabase (?) dikes were intruded unquestionably subsequent to the surrounding country. Being eruptive they came from the deep-seated interior of the earth. They could not moreover have been subsequent to the vein quartz found in and along their walls.



Fig. 1. Bannock, Nevada, Looking East, October 15.



Fig. 2. Geology of Bannock.

A A, Basalt; B B, Altered Rhyolite; C C, Silicified Porphyry Dikes With Oxidized Iron Veins; D D, Diabase Dikes—Gold Veins.

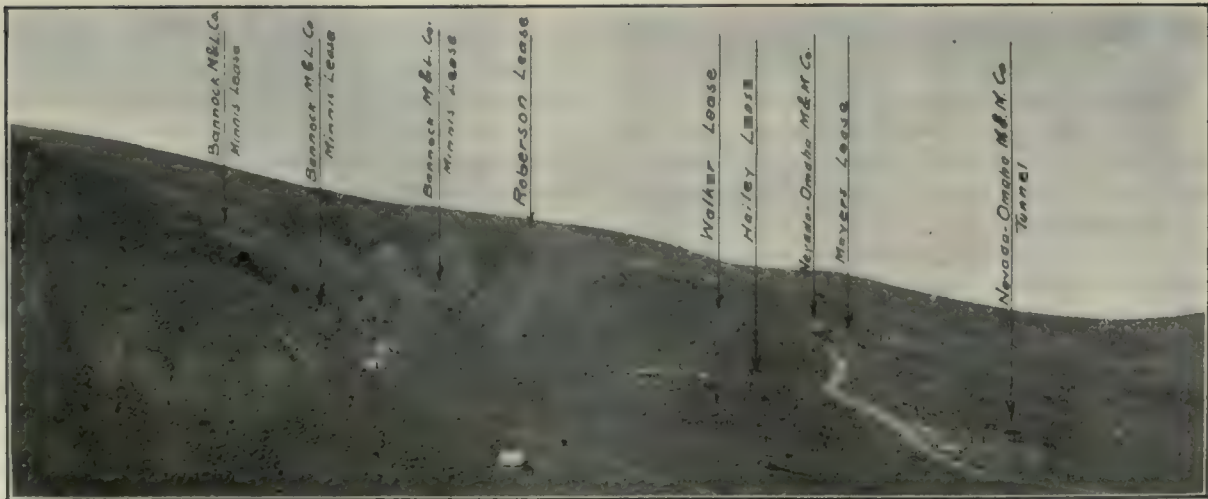


Fig. 3. Outcrops and Leases, Bannock, Nevada.

DEVELOPMENT AT THE ESPERANZA MINE, EL ORO, MEXICO.

Written for the MINING AND SCIENTIFIC PRESS
By W. E. HINDRY.

This famous mine from the date of its discovery up to January 1, 1908, had produced 1,034,662 metric tons having a gross value of ₧44,929,730 at a profit of ₧23,369,316. It is situated in the District of El Oro de Hidalgo, State of Mexico, Mexico, and is connected by a branch narrow-gauge railway with the Mexican National railway lines at Tultenango. It was denounced early in 1890 by August Sahlberg and was put on a paying basis by him. The mine is developed principally along the great San Rafael vein. This marks a fault-fissure which has proved productive through the El Oro, Esperanza, and Mexico mines.

In the development of the vein, drifts were driven along the foot-wall and at times along the hanging-wall. It was early discovered that it paid to keep them in the quartz of the vein, as although this was much harder than the wall-rock, drifts in this latter required heavy timbering and constant repairs because of the swelling of the shales upon exposure to the air. On the other hand, drifts in the quartz of the vein were much less subject to troubles of this nature. In the south section of the mine, the ore-bodies were found chiefly along the hanging wall side of the vein and in order to develop them, cross-cuts were driven through the vein every 15 metres and raises put up from level to level on the foot-wall side of the ore zone. These raises were of two compartments, 4 by 4 ft. in the clear, timbered with 8 by 8 in. timber. One compartment was lined with 2-in. plank for a chute and the other equipped with ladders for a manway. In the north section of the mine a similar proceeding was followed except that the interval between the cross-cuts was increased to 20 m., and, owing to the tendency to crush, the chutes and raises were timbered with solid cribbing 8 by 8 in., this being built in two sections in order that one compartment might be repaired while the other was in service.

Where timber was required in drifts and cross-cuts a standard drift set was used which was made of 10 by 10 in. timber for the posts and cap and a 6 by 10 in. sill. The sets were 7 ft. high in the clear and 5 ft. wide at the bottom by 4 ft. 5 in. wide at the top. They were usually spaced 5 ft. apart, centre to centre, but where the ground was heavy this was reduced to 2 ft. 6 in. and in the case of excessively heavy ground, sets made of 12 by 12 in. and 14 by 14 in. timber were used.

Soft running ground was found at various points on every level in the mine, more especially in regions adjacent to the main fault. This material had more or less the consistence of mush, due to the character of the ground and the water contained. In driving through this character of material, top and side lagging were driven under a 'bridge' on the main set, and breast-boards were used in the face, and as there was considerable of this sort of work to do, which was both slow and expensive, a regular system was devised and men trained to carry it out

were kept at this kind of work exclusively. The scheme as worked out, operated excellently. After its adoption, running ground did not interfere with good progress, as formerly. The system was quite simple and is briefly as follows:

The first procedure was to go back a short distance in the drift and put in two or three standard sets, wedging and blocking them very firmly and putting in 4 by 6 in. 'sprags' or collar braces at top and bottom. The set next to the difficult ground carried a 'bridge' of 6 by 10 in. timber on the cap with sufficient space between it and the cap to permit of the passage of the lagging to be driven, which as a rule, consisted of 4 by 6 in. timber 10 or 12 ft. long, according to the spacing of the sets. This lagging passed over the cap of the forward set and under that of the next set to the rear. The sets in this class of ground were usually spaced as close as the driving of the lagging would permit when this had

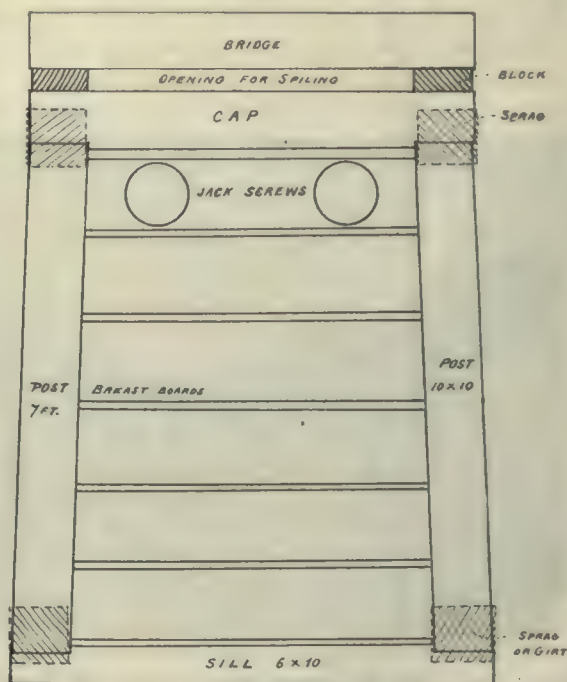


Fig. 1. Face of Drift Showing Details of Timbering.

the proper angle. As advance was made into the difficult ground, 'bridges' were placed on the posts as well as the cap and side lagging driven. The usual method of driving the lagging was by means of a ram made of an 8 by 8 in. timber, 10 ft. long, swung by a rope from the cap or lagging of one of the rear sets and capable of delivering a heavy blow when operated by two or three men.

Breast-boards were carried on the front set and these were advanced one at a time, commencing with the top, by means of jack-screws, usually a 'single-jack' machine-drill column or shaft bar, two of these being used, one on each end of the board, the rear or screw ends being supported against a timber placed across from post to post of one of the rear sets, or two timbers placed vertically. The lagging was always kept driven ahead of the breast-boards and these were advanced by means of the pressure of the jack-screws, the mushy wet material being removed from behind the board as it advanced, by hand or a small tool. Sometimes this was not necessary and in fact, precautions had to be taken to prevent a

'run' of the material even through a very small hole. After the top breast-board had been advanced a short distance (6 to 12 in. according to the nature of the ground), it was blocked in position. The pressure from the jack-screws was then transferred to the next board immediately below and this advanced to a point even with the first one and blocked as before. This process was continued until the bottom was reached, after which another start was made on the top board which was again advanced in the same manner as at first, the short blocking at the ends being removed and a longer piece substituted. This process was continued until the breast-boards had been advanced sufficiently to permit of the placing of a new set. Two pieces of timber were now placed upright against the breast-boards, leaving sufficient space between these timbers and the ends of the boards to permit of the placing of the posts of the set. The jack-screws were now transferred to the two upright timbers and a heavy pressure brought to bear on them, the result being that the breast-boards were held solidly in place by the jack-screws. The blocking which had previously been inserted at each end of the breast-boards could now be knocked out and a new drift-set placed. After blocking and wedging this the projecting rear ends of the lagging were cut away close to the cap of the next rear set. This usually resulted in the points of the lagging dropping down on the bridge of the new set just placed. The operation was repeated until the necessity no longer existed.

Sometimes, instead of allowing the lagging to project back of the second set from the breast, a 'tail-piece' was used to keep the points of the lagging at the proper angle for driving. With this method shorter lagging can be used and there will not be so much waste of timber when the rear ends of the lagging are cut away, but this saving is a doubtful economy. When once the idea of the foregoing scheme is grasped, it seems simple enough, but putting it in practice is another matter and takes considerable time and experience. Usually the beginner does not get his lagging started 'square' with the set and in the direction he wants to go. He may also get the lagging started so that in driving, some adjacent pieces cross one another or separate, which is equally bad. He also has trouble when one of the pieces of lagging strikes a hard boulder or rock in the soft material, and the proper handling of the 'battering ram' in advancing the lagging is quite a trick in itself. The blows must be delivered at the proper point, in the proper direction, and with the right intensity; otherwise there will be trouble and nothing is worse to handle than a mass of mud, water, and badly placed timber left by some novice after the failure of his attempt to get through difficult ground. The scheme as outlined is simply an adaptation of the old method of 'fore-poling', the chief innovation being the use of jack-screws for advancing the breast-boards.

The development and blocking out of the San Rafael vein revealed the fact that the orebodies of the south section were smaller in depth both in width and length. The value of the ore also decreased so that in this portion of the mine the pay-

able ore ceased at a point slightly above the fifth level. No further pay rock was found with the exception of a small body of comparatively rich ore found on the seventh level on the foot-wall of the vein. This body was not of any great extent, being roughly lenticular in shape. The ore carried considerable pyrite and the gold and silver were apparently associated with this mineral, as when the pyrite failed to put in an appearance they decreased correspondingly. Explorations in all directions failed to reveal any continuance of this orebody.

The orebodies in the north section of the mine were supposed to be down-thrown portions of the great main orebody which existed before the faulting and scoring away of the upper portion of the vein. As, geologically speaking, as the north section of the

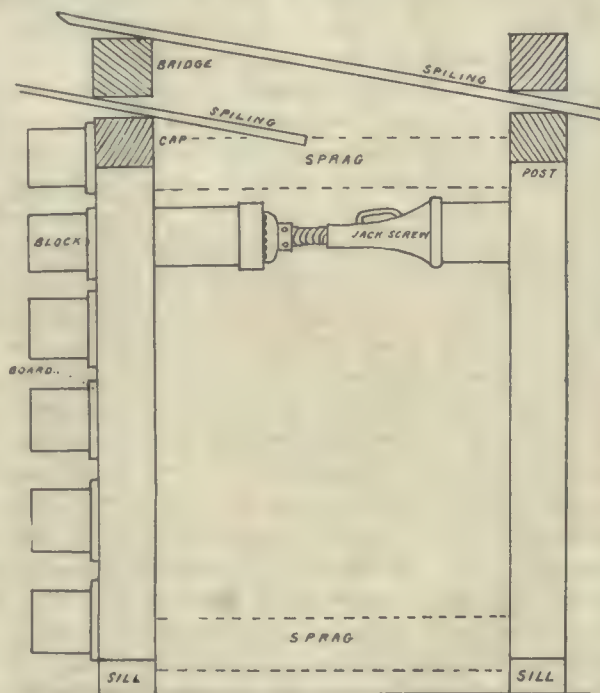


Fig. 2. Arrangement of Jack-Screws and Lagging in Soft Ground.

mine is on a much higher level than the south section, it is quite natural that the payable ore should continue below the horizontal plane where it ceases in the south section. As a matter of fact, this is the case and payable ore is found much below the known limit in the south section of the mine.

The policy of a thorough prospecting of the ground embraced by the boundary lines of the property has always obtained, and with this end in view, numerous cross-cuts were driven into the hanging and foot-walls of the San Rafael vein, some of these extending to the boundary lines. This work was usually done at such times and points that the waste material would be available for filling stopes, by which means the cost of hoisting it to the surface was avoided and what otherwise would be 'dead work' was made to serve a useful purpose in addition to the prospecting of the ground.

Cross-cut No. 14 west on the level No. 4, in the south section of the mine, was started to open the ground adjacent to this point and incidentally to furnish waste material for filling the stopes below on the hanging wall side of the San Rafael vein. In driving this cross-cut two veins were passed through, one of which gave fair assay returns and the other

scarcely any. Driving was started on the vein showing the best ore and the vein widened as progress was made toward the south and the gold and silver contents increased. It was evident that the possibilities of opening a new and hitherto unknown orebody were good. A diamond-drill was immediately put to work on the fifth level, boring a hole horizontally to the west from the end of cross-cut No. 13 west. This hole indicated that the vein at this point was some 22 ft. in width with an average content of 33 grams gold per metric ton. No time was lost in following up the drill-hole with a cross-cut, which, when it penetrated the vein, or rather veins, showed that in place of one there were two. One of these was some 10 ft. in width and contained an average of 100 grams gold per metric ton, while the other was a matter of 6 ft. in width and contained practically no gold or silver. The two veins were separated by 6 ft. of slate strongly impregnated with quartz, and this was the reason that the drill-hole indicated a single wide vein. In the meantime cross-cut No. 13 west had been started on the third level, where the two veins were also found. After opening the veins in the various cross-cuts driven for this purpose, drifts were started north and south along the payable vein (west vein No. 1) and at intervals of 50 ft., raises were put up from level to level. Finally, these veins were developed on the first, second, third, fourth, fifth, sixth, and seventh levels, and the limits of the payable ores sharply defined. It was found that west vein No. 1 was in all cases the one which carried payable ore, No. 2 vein being practically barren except in one place where there appears to have been a slight secondary deposition of gold and silver, presumably derived from No. 1 vein. The No. 1 vein had an inclination or dip to the west while the No. 2 vein dipped to the east, the No. 1 vein being faulted by the No. 2 and other minor veins and slips which, from first to last were the cause of a considerable amount of worry and much calculation in the way of platting of sections, and construction of glass models, before their vagaries as to the direction and amount of displacements were made clear.

The greatest displacement took place at the intersection of the No. 1 and No. 2 veins, the intersection line having, in the main, a horizontal direction. The displacement varied from a few feet up to approximately 50 at the greatest point. The fault is a normal one, the hanging wall having gone down. The minor faults above mentioned varied in throw from a few inches to several feet and their angle and dip appeared to be confined to no particular direction.

Vein No. 1 appeared to be the stronger and more persistent of the two and contained payable ore throughout nearly its entire mass. At the widest point it had a width of approximately 25 ft. and varied from that to nothing, the average width being not far from six feet. The vein appears never to have reached the andesite capping and is entirely contained in the slate, none of it having been scored away by erosion. The limits of this vein are characteristic, the first indication being the splitting up and 'fingering out' of the quartz, this being followed by

gradual replacement of the quartz stringers by the shales and finally the disappearance of all signs of a vein. The dimensions of this vein, as developed, showed it to have a longitudinal extent of 300 metres and a vertical depth of approximately 200. It was contained largely inside of the boundary lines of the Esperanza property. At the northern end, both veins were cut off by the main Esperanza fault, but at this point the value of the rock was small and the supposed continuations of the vein beyond the fault was of scarcely any value except at the extreme northern end of the property. Here good ore again occurred, though less extensive than in south of the fault.

The No. 2 vein was much less extensive than west vein No. 1, and as before mentioned, contained no appreciable gold, except at one point between the fourth and fifth levels where a small bunch of payable ore was found.

A curious feature in connection with the opening of these rich veins from which millions of dollars were extracted, is the fact that some time in 1897, a cross-cut was driven west on the third level which passed through both west vein No. 1 and west vein No. 2 but at a point where assay values in the first named were small and it was not, therefore, followed. A few metres to the north of this point the ore in vein No. 1 was worth \$100 per ton, and a few metres of driving would have largely changed the subsequent history of the mine, as well as given to the world the millions which came from these veins, at a much earlier date. However, the drift was not driven and the enormous wealth laid hidden for some seven or eight years more before it was finally found and handed out to the stockholders of the Esperanza Mining Co. The moral of this circumstance was not lost, however, and since that time no vein found in Esperanza ground has laid undeveloped for any great length of time.

In the meantime the development of the main San Rafael vein had not been neglected and several orebodies of considerable extent were opened in the north section of the mine, adding largely to the tonnage in sight, but as the ores were comparatively low grade, the value of the gold and silver content was naturally much less than that of the ores taken from the west veins, although the gross and net results derived from the ores of the San Rafael vein have reached exceptionally large figures.

Development on the San Rafael vein in the lower levels have been disappointing as regards finding valuable ore, there having been nothing of value found (up to the beginning of 1908) on the ninth or bottom level. Even the vein itself appears to be nearing its end. On this bottom level, the walls in both north and south sections of the mine are the same: andesite on the foot-wall and shales on the hanging wall, and the quartz vein at this point is not sharply demarked from the country rock, on the upper levels. It 'shades off' into porphyry on the foot-wall and slate on the hanging wall. All things considered, the outlook for payable ores with depth is not at all favorable, although there is still a possibility of its reappearance.

The diamond-drill was employed extensively for

prospecting purposes at the Esperanza mine, two Sullivan machines, type 'E' being used for this purpose, all holes being drilled horizontally and varying in depth from 50 to 500 ft. The ground penetrated included shales, quartz, and porphyry, the greater portion of the work being done in the shales and inasmuch as these last gave no 'core' and all information was derived from the action of the machine and character of the sludge flowing from the hole, the results obtained were not always conclusive. In many instances the holes were followed with cross-cuts in order to verify indications obtained with the drill.

Complete graphic records were kept of this work, showing location of hole, direction, inclination, when begun, when finished, character of ground penetrated, assays, total distance drilled, and other features. These were prepared as blue-prints and filed in the various archives of the company at El Oro, New York, and London. The following itemized costs of this class of work for the years 1904, '05, and '06 will probably be of interest:

UNDERGROUND, DIAMOND-DRILL PROSPECTING, ESPERANZA MINE.

| | —Average cost per foot— | | |
|------------------------|-------------------------|--------|--------|
| | 1904. | 1905. | 1906. |
| Labor | \$1.94 | \$2.50 | \$2.38 |
| Power | 0.47 | 0.27 | 0.16 |
| Carbon loss | 0.20 | 1.77 | 3.53 |
| Tools and implements.. | 0.01 | 0.04 | 0.01 |
| Repairs | 0.26 | 0.56 | 0.66 |
| Miscellaneous | 0.32 | 0.07 | 0.01 |
| Total | \$3.20 | \$5.21 | \$6.75 |

Development consisted mostly of drifts, cross-cuts, and raises, with an occasional winze and the average costs for same per lineal foot are given in the following table:

DEVELOPMENT COSTS.

(Ground penetrated: slate, porphyry, and quartz.)

| | Average cost per lineal foot. | | | |
|------------------------------|-------------------------------|---------|---------|---------|
| | 1904.* | 1905. | 1906. | 1907. |
| Feet driven | 3,287 | 10,812 | 12,333 | 10,411 |
| Drilling labor | \$9.59 | \$6.85 | \$7.17 | \$7.37 |
| Drilling power | 5.85 | 2.70 | 2.63 | 1.49 |
| Drilling pipe lines..... | 0.23 | 0.10 | 0.09 | 0.19 |
| Explosives | 1.33 | 1.23 | 1.24 | 0.81 |
| Tools and implements..... | 0.40 | 0.49 | 0.21 | 0.19 |
| Timbering labor..... | 1.08 | 1.09 | 1.71 | 1.55 |
| Timbering supplies..... | 1.16 | 1.44 | 0.85 | 0.81 |
| Timbering repairs—labor | 1.03 | 0.48 | 0.58 | 0.67 |
| Timbering repairs—supplies.. | 0.56 | 0.53 | 0.16 | 0.40 |
| Trucking labor | 0.01 | 0.01 | .... | .... |
| Trucking supplies | 0.17 | .... | .... | .... |
| Loading and tramming..... | 0.80 | 1.01 | 1.38 | 0.81 |
| Hoisting and tramming..... | 3.40 | 2.04 | 1.71 | 1.60 |
| Drainage | 2.19 | 1.00 | 0.67 | 0.56 |
| Drainage pipe-lines..... | 0.10 | 0.05 | 0.03 | 0.03 |
| Lighting | 1.25 | 1.11 | 0.93 | 0.79 |
| Ventilation ..... | .... | .... | 0.13 | 0.17 |
| Assaying | 1.01 | 0.85 | 0.61 | 0.67 |
| Miscellaneous labor | 0.03 | .... | 0.01 | 0.24 |
| Miscellaneous supplies..... | 0.12 | 0.03 | .... | .... |
| Maintenance: | | | | |
| Buildings and surface im- | | | | |
| provements | 0.26 | 0.19 | 0.16 | 0.10 |
| Surface machinery | 1.15 | 0.94 | 0.74 | 0.88 |
| Underground machinery.. | 2.13 | 1.97 | 1.57 | 1.11 |
| Tools and implements.... | 1.31 | 0.73 | 0.62 | 0.57 |
| Total | \$35.16 | \$24.84 | \$23.20 | \$21.03 |

*For six months.

GOLDFIELD MILL IMPROVEMENTS.

Written for the MINING AND SCIENTIFIC PRESS
By Our Special Correspondent.

The recent loss of the Combination mill is being offset by building an addition to the large mill of the Goldfield Consolidated Mines Co. A large portion of the additional equipment has arrived and the work of installation is now in progress. Probably the plant will be in full operation by December 20. All foundations and retaining walls have been in place for some time. The new machinery will not necessitate any additions to the present mill structure.

In addition to six 6-ft. Chilean mills, the equipment will include 26 Deister concentrators, four 8-ft. Callow classifying cones, a high-power electric pump, 2 agitators, and 2 elevators for use in supplying the Chilean and tube-mills. The grinding capacity of the plant will probably approach 100 tons per day, but the tonnage will be so regulated by the capacity of the cyanide plant as to be about 900 tons. The Chileans will be installed below the stamps on the second floor and close to the retaining walls carrying the greatest pressure. They will be divided into two groups of three each, situated at the north and south extremities of the plant. Immediately below the stamp-batteries and above the Chileans, and distributed at regular intervals along the length of the structure will be the 8-ft. Callow classifying cones.

The Deister tables will be divided into two groups of nine each on the floor with the Chileans, and two of four each at either end of the stamp-batteries. For the purpose of returning the over-size from the tube-mills to the classifiers the two elevators are being installed, the pulp going from the classifiers to the Chileans. The pump and compressor for the cyanide plant are on the lower floor. Direct amalgamation of the concentrate will replace largely table amalgamation below the stamps, thus saving the coarse gold before the product is sent to the cyanide tanks and effecting a saving of time in cyanide treatment. A further saving of free gold will be made by the use of blankets covering the second plates.

By the new system it is expected that a further saving above the present 94% will be effected. In the refinery, which is a part of the plant, all products of the mill are reduced to ingots of bullion or high-grade amalgam before sending to the United States mint at San Francisco, or to the Selby smelter. The process employed in treating concentrate was perfected by Mr. Hutchinson, superintendent of the Consolidated mill, after exhaustive experiments conducted during several months in the old 10-stamp Kinkead mill, on the south slope of Columbian mountain, which the company operated under lease as an experiment plant and laboratory. As a result of these experiments, the present refinery was constructed after the completion of the 100-stamp mill, and has proved highly satisfactory in operation, a saving in transportation alone of a large sum annually. The saving made in the big mill has been extremely satisfactory and with the addition being made the capacity will be notably increased.

Steel castings were first made in the United States for the Philadelphia & Reading railroad in July 1867.

MICA DEPOSITS OF SOUTH DAKOTA.

By DOUGLAS B. STERRETT.

*A number of mica mines are situated within a radius of 8 miles of Custer, South Dakota, in the southern part of the Black Hills. This area includes the better deposits of mica so far found, though some deposits occur 12 to 15 miles north of Custer, on the north side of Harney Peak. Previous to 1906 the production of mica in South Dakota had been small for several years, being often only that obtained from assessment work on the claims, but in that year the Westinghouse company took up several mines and prepared for systematic and extensive work. The success of this company has raised South Dakota to second rank among the mica-producing States.

The geology and mineral resources of the Black Hills have been described by numerous writers. Of the reports on geology those of Newton and Jenney¹ and of Darton,² taken together, furnish an excellent description. The mica resources have been treated in the South Dakota Geological Survey reports and have been mentioned in a number of the annual reports on the mineral resources of the United States published by the Federal Survey. A booklet with geologic map by Samuel Scott,³ of Custer, South Dakota, serves as a useful guide to the general geology of the Black Hills.

The Black Hills are a group of mountains rising to a maximum elevation, in Harney Peak, of 7240 ft. above the sea, or 3000 to 4000 ft. above the surrounding plains. They form an oval uplift about 125 miles long from north-northwest to south-southeast and 60 miles wide. The core of this uplift is composed of highly metamorphosed slates, gneisses, and schists with granitic intrusions. This core of ancient rocks is completely encircled by strata of later formations, which dip away from the core on all sides and were evidently once continuous over its top as a dome.

The granite formation of the Black Hills has its greatest development around Harney Peak and southward to Custer. Other smaller bodies and the pegmatites, into which it appears to grade in some places, occur in various parts of the highly metamorphic areas. Much of this granite has a very coarse texture and in some places it is difficult to know whether to classify the rock as granite or pegmatite. The pegmatite occurs both in the metamorphic rocks and in the granite.

In the Black Hills as elsewhere muscovite mica of commercial value is found in pegmatite. In this rock mica occurs as an accessory mineral of more or less prominence, the essential constituents of pegmatite being feldspar and quartz. The feldspars

are commonly orthoclase or microcline, though a plagioclase, albite, or oligoclase is present in some pegmatites, and locally plagioclase is the predominant feldspar. Pegmatites thus have the same constituent minerals as granites, though generally deficient in biotite and lacking in other accessory minerals, as hornblende or pyroxene. The proportions of the constituent minerals vary widely, not only in different bodies, but even in the same body. In some places the mass is chiefly feldspar with but small amounts of quartz and accessory minerals; in others quartz is the principal mineral. The deposits of mica-bearing pegmatites around Custer probably have a more uniform mixture of feldspar and quartz than many of those in North Carolina. Around Custer, where the best mica deposits have been found, only one pegmatite in many carries sufficient mica to pay to work. J. A. Holmes⁴ estimates that in some portions of the New York mine mica composes 10% of the whole pegmatite, but that in others it forms not more than 1%. Figures given by Mr. Pyne, the present superintendent, show that the rough mica obtained along the walls of the pegmatite (the only portion worked for mica in this mine) amounts to 6 or 7%. The interior of the pegmatite at this mine carries very little mica, say 0.5%; this would give about 2.5% of mica in the whole mass of pegmatite.

The texture of pegmatite may be like that of coarse granite, sometimes called giant granite, or the individual minerals may be separated into large masses in different positions in the pegmatite. These masses may be irregular in shape or arranged in bands generally parallel with the walls, giving the mass a veinlike appearance, as in many of the mica 'veins' of North Carolina. The mica-bearing pegmatites around Custer show a tendency toward an evenly granular texture or irregular segregation of mineral masses rather than a banded structure. In much of the rock there is, however, a rough banded arrangement in the segregation of the mica crystals along one or both walls. This structure does not resemble that of a vein so much as where bands of a single mineral, as quartz or feldspar, occur. The crystal of feldspar and irregular masses of quartz may attain dimensions of several feet across in pegmatite.

The shape of pegmatite bodies is variable. Some are rather persistent in length and form dikelike or veinlike bands or sheets that can be traced for several hundred yards. Others are lenticular in shape and occur either in short thick masses or in long slender bodies. Many of the pegmatite masses are irregular in shape and are quite difficult to follow in mining. Some pegmatite bodies lie conformably with the schistosity of the inclosing gneiss or schist either through part or the whole of their extent; others cut across the bedding of the rock formations. In places the lenses or sheets follow the irregularities of the enclosing rock. In this way they may be interfolded with gneisses and schists, or bulge or elbow out abruptly. Pegmatites may range in thickness from less than an inch to many yards, and the lenses may vary in length from 2 to 20 or more times the thickness.

*Abstract from 'Contributions to Economic Geology, 1908', U. S. Geol. Surv., Bull. 380.

¹Newton, Henry, and Jenney, W. P. 'Geology and Resources of the Black Hills of Dakota', U. S. Geol. and Geol. Surv., Rocky Mt. Region, 1880.

²Darton, N. H. 'Preliminary Description of the Geology and Water Resources of the Southern Black Hills', Twenty-first Ann. Rept., U. S. Geol. Surv., pt. 4, 1901.

³'Rocks, Minerals, and Other Resources of the Black Hills'.

⁴Twentieth Ann. Rept., U. S. Geol. Surv., pt. 6; continued, 1899, p. 693.

The pegmatites observed around Custer exhibit many of the above described characters. Some occur in regular sheets whose outcrops can be traced for several hundred yards; others are typically lenticular. Some lie parallel with the schistosity of the enclosing rock and others cut across the rock. The general features of the pegmatites around Custer resemble those of dikes, the veinlike type being rare or absent.

The No. 1 mine of the Westinghouse company,

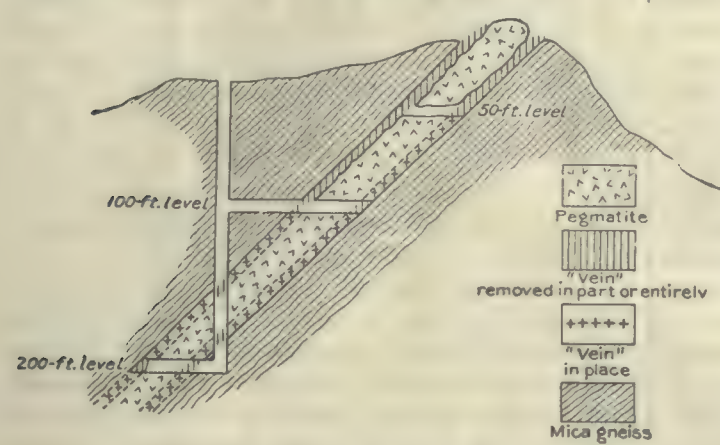


Fig. 1. Generalized Cross-Section of No. 1 or New York Mine.

formerly called the New York mine, is 5¼ miles southwest of Custer, between Hay and Four-Mile creeks. The mine is a small prominent hogback-like knob 700 ft. long and about one-third as wide.

The country rock is biotite gneiss and schist striking northwesterly and dipping about 50° southwest. The pegmatite is approximately conformable with the enclosing gneiss. The contact of the two is sharp, though with gentle rolls along the strike. The pegmatite has a thickness across the dip of about 30 ft. at the surface, 25 on the 100-ft. level, and 28 on the 200-ft. level. The mica occurs in two streaks or 'veins' in the pegmatite from 1 to 8 ft. thick along each wall. The interior of the pegmatite is nearly barren of mica or too poor to pay for working. Although the mica streaks vary in thickness and richness they are unusually regular for mica. The mica crystals occur in flattened or tabular blocks lying perpendicular to the walls of the pegmatite. The more common size of crystals ranges from 2 to 8 in. diam. and from 1 to 5 in thickness. Crystals a foot in diameter are not rare, while some measuring a yard across are found.

Fig. 1 represents a generalized cross-section of the pegmatite 'veins' and workings at the New York mine. The records show an average of 600 lb. of rough mica to 10 sq. ft. of 'vein' removed. The veins average from 5 to 6 ft. thick, say 5½ ft. If the weight of a cubic foot of pegmatite is estimated at 163 lb., it is found that the rough mica obtained averages about 6.6% of the vein matter.

The No. 2 mine of the Westinghouse company, formerly known as the White Spar mine, is 1¾ miles S. 40° W. of Custer. The vein is about 40 ft. thick at its outcrop, 25 at the 50-ft. level, and 18 to 20 at the 100-ft. level. The country rock is biotite gneiss, in which highly schistose beds are prominent. The pegmatite is roughly conformable with the enclosing biotite gneiss, though locally ir-

regular. The mica is distributed through the pegmatite with varying regularity. It was estimated that in one such portion southeast of the shaft on the 50-ft. level mica composed nearly 50% of the pegmatite. This mica occurred in blocks of all sizes up to a foot in diameter. The edge of one block of mica, or several blocks closely joined together, projecting from the floor, was nearly 5 ft. long and from 2 to 12 in. thick in different parts. The No. 3 mica mine is 3½ miles west of Custer and has not yet been actively developed. The No. 4 mine is five miles N. 15° E. of Custer, in a ridge separating two branches of the headwaters of French creek.

The Crown mica mine, of the Chicago Mica Co. is 2½ miles northwest of Custer. It has been worked by several open-cuts—the main one about 130 ft. long and 25 ft. deep and wide—a 20-ft. incline from the bottom of the cut, and 100-ft. shaft with a cross-cut to the 'vein', a drift, and a stope. The country rock is muscovite-biotite gneiss, with straight slaty cleavage in some places and a plicated structure in others, especially near the pegmatite bodies. The pegmatite is about 10 ft. thick, and is in part, at least, conformable with the schistosity of the gneiss.

The commercial applications of mica are numerous. The principal use at the present day is in the manufacture of electric apparatus. In the early days of

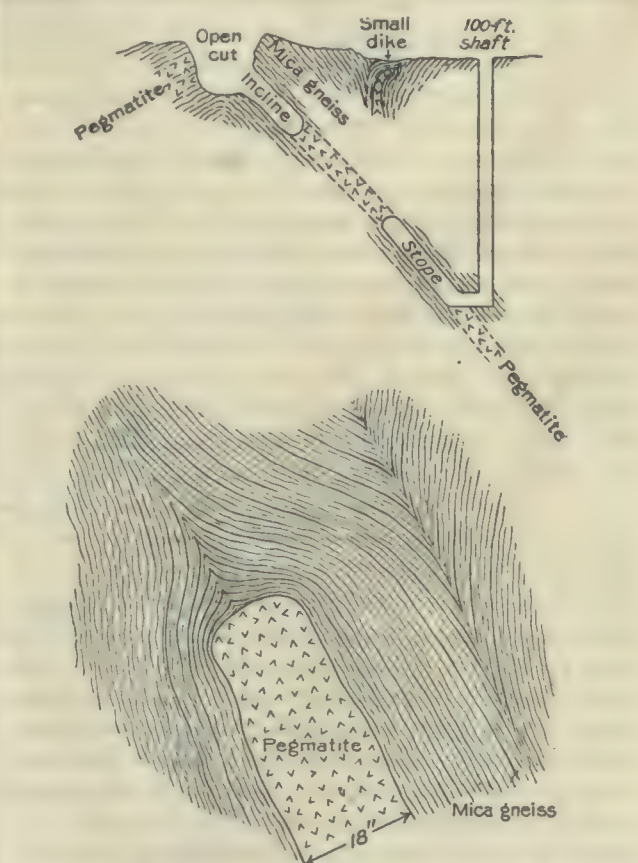


Fig. 2. Generalized Cross-Section of Crown Mica Mine, With Sketch Showing Relation of Pegmatite to Enclosing Gneiss.

the industry in this country the chief demand for mica was for glazing purposes, principally in stove manufacture. This has now become one of the lesser uses, along with the manufacture of gas lamp chimneys, and similar articles.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

A Correction.

The Editor:

Sir—In a recently published article in the MINING AND SCIENTIFIC PRESS regarding mining operations on the Mother Lode in Amador County, Cal., the writer made a misstatement regarding the Bunker Hill mine, namely, that the Bunker Hill had come into prominence within the year by beginning to pay dividends after a long period of unsuccessful operation. This was an error, as the Bunker Hill has recently paid its 39th consecutive monthly dividend and on December 15 will pay dividend No. 40, and an extra, No. 41.

W. H. STORMS.

Sutter Creek, California, December 8.

Miners' Unions.

The Editor:

Sir—In your editorial, December 11, on the Homestake strike you contrasted the Western Federation of Miners and the United Mine Workers of America, greatly to the advantage of the latter. What you have said is accurate enough, but it may be helpful to point out some of the reasons for the broader outlook of the coal miners' union, despite the well known fact that its members are in general both poorer and less well educated than are the members of the Western Federation. Indeed, the United Mine Workers is largely made up of the 'ignorant foreigners' we are so accustomed to blame with all our troubles. The Federation has a much higher percentage of the native born among its members. Average wages for metal miners are undoubtedly higher than for coal miners, and the opportunity for individual advancement is quite certainly better. The members having these superior opportunities, the Western Federation ought apparently to be the better managed organization. The reason that it is not lies deep. Unions are an expression, as well as a cause of the growth of 'class consciousness'. The coal miners are mainly of a class that have been laborers for generations and expect to continue to be laborers. Expecting always to stay in the mines and expecting their sons to follow them in the work, they have determined as far as possible to improve the conditions under which they work, and their own economic position as workers. The metal miner, on the other hand, regards his position as temporary. He is usually looking forward to 'getting in on a lease' or to 'getting a fat contract', or at least to getting a grub-stake so that he may go prospecting. The number that expects always to remain in the mines working for days' pay is relatively small. As a result, their attitude toward the conditions of mining is different, and their sense of responsibility is less. What does a row more or less matter so long as one only means to stay a short time anyway? It is the universal experience of mine managers that married

men, men who have children, and men who own homes, are less easily led into stampede strikes, and are more reasonable in their attitude.

Another great difference in the two fields lies in the fact that coal mining is a competitive business in which the rational organization is by districts rather than by mines. All the operators as well as all the men in a given district have much the same conditions to meet. The units are larger and the men from different mines live in the same or adjacent towns. Inter-mine organization is therefore easier and in labor unions, as in other business organizations, growth in size and importance brings a sense of responsibility. The main factor, as I believe, in the better position of the United Mine Workers is that the organization subserves a real economic function, and that this was early discovered and utilized by a certain group of operators.

Coal mining, as already stated, is competitive, and competitive, it may be added, to a degree that the Western metal operator knows nothing of. The margins are small and the fight of district against district for the common market is intense and unremitting. The United Mine Workers of America originated in the longwall field in northern Illinois. The discovery and opening of the thicker beds of coal in the southern part of the State led to such cheap production as threatened the total extinction of an old and well established industry in the field nearest Chicago. Wages and profits went down to the point where both men and operators might as well fight as starve. This condition, as always, brought out real leaders, and the net result was that the northern operators supported the union in return for the latter organizing the southern miners and forcing wages to a point that equalized competition. The discovery of this power of the union to equalize competition gave it new place and dignity, and was, I believe, the prime factor in its growth. Today in the coalfields the prices paid labor have less relation to local supply and demand or to the difficulty of the work, than to the other costs of coal production and distance to market. Wages and freight rates are adjusted so as to give, as nearly as may be, a fair field and no favors in competitive markets. If some operator or district secured a reduction of freight rates a corresponding increase in wages is apt to follow.

In the meantime a well organized machine has been built up by both operators and miners, for the conduct of negotiations and settlement of difficulties. Collective bargaining, because of widespread uniformity of conditions in the coalfields, is applicable to an extent which seems impossible in metal mining. The result is that large problems are considered on both sides, and here, as elsewhere in American life, large problems bring out large men. It has repeatedly happened that a miner who was a true fire-eating radical when in the ranks has mellowed and broadened as he worked his way to the top, until, as a responsible officer, he was excellent. The operators have found, almost without exception, that ex-union officers make the best commissioners in behalf of the employing organizations. They know the game, and they have the confidence of the men. It is a curious

and interesting commentary on the situation that this employment of ex-union officials to treat with the men on behalf of the operators has led to almost no charges of bad faith.

All this is interesting only as it throws light on the Western situation. These conditions are different in many particulars, but what I should like to especially point out is that as the coal operators came to trust and work with their men, the latter have responded to the treatment. This much may, I think, be fairly claimed without in any way attempting to justify all of the acts of the union or its officials. Progress toward better conditions industrially is slow, as evolution was in nature, but if it be progress we can forgive the persistence of an occasional vermiform appendix.

OBSERVER.

Berkeley, California, December 13.

Pan-Americanism.

The Editor:

Sir—At the end of the Spanish-American war, Pan-America was but a phrase, a satire or a jest, and it is notable and notorious that during that war Spain held the sympathies of quite the majority of the South American countries. Territorial aggrandizement was the imputed motive of the United States in precipitating the war with Spain, and such a policy, it was believed, would jeopardize the independence of Latin-American governments. True, the past activities on the part of the Government of the United States to disillusion the South Americans of these erroneous conceptions in regard to our foreign policy, have modified and alleviated the situation, but there still remains, due to this failure to comprehend our foreign policy, some shadows of the old sentiment, that the United States stands as a menace to the continuation and preservation of distinct individuality on the part of Latin-American countries.

The causes for this misunderstanding appear not to be at all difficult to grasp, and may be safely attributed to the lack of direct and profuse intellectual contact with the United States coupled with the reliance of these countries for intellectual stimulus upon France and Germany—a medium through which facts or attitudes may readily be refracted or distorted. The beginning of intellectual intercourse with the United States may be noticed in such concrete forms as the Pan-American Scientific Congress and the Bureau of American Republics.

That there is a permanent Pan-American spirit—and that such a spirit of paternal co-operation is the inevitable outcome of environment and conditions, are, in my mind, two facts. True, intellectual stimulus has been and is of a Continental source, as is also the major portion of foreign commerce in Latin-America. Stranger still are the ethnological features of similarity in language, customs, and antecedents. It is a matter of history, that, generally speaking, the northern and southern continents in the Western Hemisphere were occupied by Europeans simultaneously—and, with similar motives. The north ultimately founded a single nation composed of several States. The colonists of South America, on the other hand, did not succeed in forming a federation or even a confederation. The more speedy adaptation

of the English to conditions as they found them is not surprising, as well as the failure of speedy adaptation to environment and conditions on the part of the Spanish colonists. The political tenets and beliefs of Spaniards and Portuguese are not to be reconciled with conditions in Latin-America. The history of Latin-America is characterized throughout by the struggle between the traditions and customs of Europe and conditions of life made necessary by immigration. It was practically predetermined that these colonists, in no way prepared by previous training in democracy, should find adaptation to their environment a difficult matter, and that it should necessitate struggles to adjust themselves to this new scheme of things. From totally dissimilar political institutions and social forms, Latin-American countries have developed forms of government, singularly similar to that of the United States.

Forms of government and politics are not now, however, the serious problems demanding solution in Latin-America, but rather social, educational, and economic problems. These are well exemplified by the present state of affairs in Costa Rica. The laboring classes are awakening to a consciousness of importance and power, and especially to the realization or appreciation of the benefits of an educational system embracing all classes. The readjustment of social order, which surely will follow the propagation of such ideas, is causing stresses and strains in the members of the social structure, and it is to be hoped that when the social structure is at last completed the thrust and tension will have been so harmoniously adjusted that equilibrium will be assured.

Extensive intellectual contact between the two continents in the Western Hemisphere is so far lacking. It is true—but difficult to imagine—that, as a whole, the United States completely fails to recognize the importance and extent of the influence she wields in South America. But I presume this seeming indifference may be attributed to the fact that such an ample field is afforded at home for the development of every activity; and, too, we are prone to estimate a country first upon its commercial possibilities. The advance movements in art, science, and morals in the southern republics have not been forced upon our consciousness.

The positive experience of Germany and the negative experience of Great Britain have demonstrated that in Latin-America the commercial possibilities for foreign capital depend upon the development and maintenance of a close sympathy, moral and intellectual bands, and ties of friendship. South Americans fully appreciate that there exists in the United States, due to both ignorance and misinformation concerning their affairs, if not an indifference bordering on hostility, a decided prejudice. At the same time their minds revert to the United States as their natural ally. Unity between western governments such as would presage ill success for any policy of territorial aggrandizement upon either the part of Europe or the Orient, is of utmost importance to all concerned, and such unity must rest on the firm basis of friendship and close intellectual sympathy.

LEE FRASER.

San Mateo, Costa Rica, September 30.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Power to the amount of one brake-horsepower per hour is generated from 1 to 1.25 lb. of coal, or from 3 lb. of wood in ordinary gas-producers. The gas contains about 80% of the original heat-energy of the fuel.

Gas-engine efficiency under the best conditions may reach 27% of the fuel-value of the gasoline or distillate. This, however, is a high figure. Ordinarily 20% will be considered good work. About 45% of the fuel-value of the hydro-carbon is lost in the exhaust, and from 30 to 35% in the cooling-water.

Resins are deleterious in the amalgamation of gold. They also cause foaming of the water and interfere with concentration. Resin may be introduced into the pulp by shavings and chips from the setting of mine timbers. Some explosives also contain resin, and unless the detonation of the powder is complete, unconsumed resin comes to mill with the ore and reduces the extraction of gold.

Carnallite, the commercial potash mineral, has the formula $\text{KMgCl}_2 \cdot 6\text{H}_2\text{O}$. It is generally massive, with conchoidal fracture, leaving a rough, granular surface, lustrous and greasy. The color is milk-white, sometimes reddish, and it is translucent to transparent. It is strongly phosphorescent. It absorbs water from the air (deliquescent); and has a bitter taste. It is as soft as talc, and has a specific gravity of 1.6. Douglasite is often associated with carnallite, its composition being $2\text{KCl} \cdot \text{FeCl}_2 \cdot 2\text{H}_2\text{O}$.

Castings, which were warped in cooling, may be straightened by re-heating and carefully weighting to bend them back. While still hot they may be moistened with water on the convex side which will cause that side to contract faster, and if carefully done, the casting may be brought true. In bending back by re-heating, the ends should be weighted, and the casting bent about as much in the opposite direction as the original warp. When cold, it will then be about straight.

Superheated steam is steam in a form analogous to air, that is, it exists heated beyond its critical temperature, so that no amount of pressure can cause its liquefaction, while remaining so heated. The advantages of superheated steam are mainly in the fact that practically all the extra heat put into it in superheating can be transformed into useful work. Steam formed in contact with water is saturated; by passing it slowly through pipes maintained at a high temperature all the water absorbed into the steam is vaporized.

Snake bites should be treated by ligaturing the bitten part at once with a tourniquet of cloth or rubber, and injecting locally a 1% solution of potassium permanganate. Alcoholic stimulants and

ammonia are absolutely harmful in critical cases. They are of value as restoratives only in cases where the person has not been fatally bitten. A special antiviral serum is now made at the Rockefeller Institute, New York, which is efficient in all cases except where an extremely large amount of the poison has been injected directly into the vein. This serum may be obtained from the Institute.

Producer-gas scrubbers are of two principal kinds, namely, tower-scrubbers, and mechanical. The former contain a series of shelves inclined alternately in opposite directions. Water trickles over these, dropping off the edges as a film through which the gas passes. The height is from 4 to 6 times the diameter. Mechanical scrubbers rotate, the gas passing through the contained rotating body of water. One form revolves slowly, the object being merely to cause a mixture of the gas and water. Another form rotates at high speed, centrifugal force separating the impurities from the gas.

Potassium salts in small quantities have been found widely distributed through the arid regions of the West, particularly in Utah. At one time a company was formed to work deposits in a porous sandstone in Hobbie Creek canyon, eight miles from Springville, Utah county, in that State. Another deposit was discovered near Milford, in Beaver county. A deposit is also known near Mount Hope, Eureka county, Nevada. Quite important beds occur in the vicinity of Humboldt, Nevada. There are possibilities of finding nitre beds in many parts of the desert regions of southern California, as well as in Nevada, Utah, and Arizona.

Amparo, as related to mines in Spain and Spanish America, is the maintenance of possession in mining property by compliance with the provisions of the law regarding taxes and other dues. In those countries title to the minerals is considered to lie in the State, which may cede such right to individuals, with all the privileges pertaining to absolute ownership. These, however, may be lost at any time by failure to perform all the acts specified by law in such cases. The existing systems of *amparo* are founded upon the old Spanish law (*Novísima Recopilación*) of the year 1387, Tit. 18, lib. 9, in which mining concessions were provided for on payment to the Crown of two-thirds of the gross output.

Potash salts are deposited on the evaporation of inland lakes in regions where the soils yield soluble potassium compounds. Tolman has found that the quantity of soluble potash salts was higher in the fine than in the coarser soil-particles in the arid Southwest. Granitic residual soils are particularly rich in potash. The potassium salts being more soluble than sodium salts, deposit above salt and gypsum beds on the drying up of salt lakes. At Stassfurt, Germany, the present source of the world's potash, the chief mineral containing that substance is carnallite, a hydrated double chloride of magnesium and potassium. The workable beds, lying above the great rock-salt beds, contain 16% of potassium chloride.

Special Correspondence.

WASHINGTON, D. C.

Suits Against A. S. & R. and State of Colorado. — Goethals to be Promoted. — Secretary of the Interior and the Geological Survey.

The Federal Government is considering beginning action against the A. S. & R. Co. to recover \$3,000,000. A proposal to enter suit against the State of Colorado for the value of 35,000 acres of mineral land, alleged to have passed into State control through misrepresentation, is also under consideration by the Department of Justice. Prompt action in both cases depends upon the decision of the Attorney General as to whether or not the cases are barred by the statute of limitations. The Interior Department last August forwarded a number of papers to the office of the Attorney General bearing upon the alleged claim against the A. S. & R. Co., and formally requested that suit be instituted. The papers are said to contain evidence that 'dummy entrymen' acquired title to many hundred acres of valuable coal deposits from the Government and disappeared from view when the titles to this land were safely with the smelting company. Since the documents were forwarded to the Department of Justice nothing has been done in the case, and nothing will be done until a certain test case, now pending in the West and involving the statute of limitations, is settled. Upon this decision, it is declared, rests the fate of this claim. Records on file at the Bureau of Corporations disclose 2000 acres of land, valued at \$200,000 and situated in Reilly Canyon, Colorado, as property "owned by or in the interest of" the A. S. & R. Co. The Carbon Coal & Coke Co. operates mines on the lands. The output thus far this year is said to be 250,000 tons. Titles to these coal lands, which passed to the smelting company more than six years ago, are said to have been the objects of particular enquiry by the Land Office agents during last year. The legal officers of the Interior Department, while admitting that the statute of limitations regarding land titles has operated to prevent the Government from regaining the lands, assert that it can sue for the amount alleged to have been obtained through fraud. As to the claim against the State of Colorado, the board of law review of the Interior Department has been unable to agree. The Congressional act which made Colorado a State in 1876 granted to it a large number of sections of the public domain, to be disposed of or used for school purposes or for the erection and maintenance of public buildings. A clause in the enabling act stated that lands of a mineral character should not be taken, and where inadvertently taken should be exchanged for lands valuable chiefly for agriculture or for timber and stone. Agents for the General Land office have reported that a great quantity of mineral land has been taken, and that the State has acquired and is leasing coal lands which will ultimately yield the State the sum of \$250,000,000 in revenue. It appears that these allegations of the Land Office agents have had the effect of starting an investigation to determine whether the Government, at this late day, can allege fraud and sue for damages. The officials have been unable to agree that the statute of limitations, which ordinarily works to clear titles of public lands which have passed to patent or have been granted by the Government, can be set aside in this case by a direct suit for damages, and the case has been laid before the Attorney General with the request for an opinion.

Lieut. Col. George W. Goethals, chief engineer of the Isthmian Canal, according to reliable report, may become the next Chief of Engineers of the army. Brig. Gen. W. L. Marshall, the present incumbent, will retire next year, and although Col. Goethals is not the ranking official in the engineering division, it is believed the President will desire to reward him for his work on the Isthmus. His promotion, it is asserted, would not require his relief from the canal direction, although he would not be on the Isthmus as much as at the present. President Taft has formally accepted the resignation of Joseph C. S. Blackburn as Governor of the Panama Canal Zone.

The annual report of Richard A. Ballinger, Secretary of the Interior, is considered here in Washington to be one of the ablest documents issued by the Government in some time, dealing as it does with a number of questions that loom large at the present time on the national horizon. Reviewing the work of the United States Geological Survey, the Secretary says: "The appropriation for the work of the Survey for the fiscal year aggregated \$1,590,680. While the work of the bureau was hampered by the fact that this appropriation is not large enough to carry out as fully as is desirable the varied lines of investigation and research, material and important results have been obtained in aid of the administration of the Department and for the information of the general public. This is especially notable with reference to public lands. Geologic surveys and investigations were continued during the year in 39 States and Territories, and over 55% of the appropriation for geologic surveys was expended in the 16 public-land States and Territories. In connection with the land classification work, about 16,000 square miles of supposed coal territory in the Rocky Mountain region was examined. Other work in the public-land States included commencement of the study of the phosphate deposits in Idaho, Wyoming, and Utah, the continuation of systematic detailed surveys of important mining districts in Colorado, Utah, New Mexico, Arizona, Nevada, and California, and of oilfields in southern California and Colorado and an extension of areal geologic work in these and other States. The general investigation of the water resources of the country has been continued along previous lines. The scope of the investigations has recently proved to be of national significance in connection with the temporary withdrawal. To withdraw from entry power-sites on the public domain intelligently would be impossible without definite information, but with the aid of the information which the Survey has collected during the past years, it has been possible to withdraw a large number of power-sites immediately, and many more can be withdrawn in the near future by reason of the fact that incomplete information is now available that can soon be made practically complete. Technologic work was carried on during the year in fuel investigations, structural material investigations, and mine accidents investigations. The first has included an enquiry concerning the fuels of the public domain and also the fuels for use by the Government. The larger part of the fuel used by the Government, aside from that used on board naval vessels, involving an annual expenditure of more than \$5,000,000, is now purchased under specifications prepared by the Survey, and the coal is sampled and tested by that organization. A like treatment is accorded crude petroleum and other mineral fuels used by the Government. In connection with the building and construction work, the materials to be used are now being generally tested by the Survey. These include materials for more than 300 public buildings in various States and Territories, recently authorized by Congress, involving an expenditure of over \$50,000,000. Structural materials for use in the engineering works of the Panama Canal, by the Reclamation Service, and by several bureaus of the Army and the Navy are also being examined. The investigations into the causes of explosions in mines have included examinations and analyses of explosives used in coal mining in the United States, examinations into the occurrence of explosive gases and dust and of those mines in which explosions have occurred during the year, examinations of so-called 'safety' lamps used in mines and of mine-rescue apparatus. The manufacturers of explosives used in coal mining have voluntarily submitted their explosives for testing by the Survey and have withdrawn from the market a number of explosives that failed to pass these tests. They have also made commendable efforts to increase the safety of their explosives even beyond the requirements of these tests and have shown a desire to carry out the wishes of the State Inspectors and the recommendations of the Federal engineers and chemists. In view of the fact that more than 85% of the fatalities in our coal mines are due not to explosions, but to other, though in many cases related, causes, it is important that the scope of the investigation be extended to include all conditions which make for greater safety in mining."

BUTTE, MONTANA.

Mining in Broadwater County.—Radersburg.—Ohio-Keating.—Ruby Gulch and Chouteau County.—Northwestern Metals Co. Mill.—Boston & Alta.

Radersburg was highly productive of rich, oxidized gold ore during the early days of mining in Montana. In the last few years development has extended below the oxidized section, into a clean, sulphide ore, running 35 to 40% silica, 52 to 56% iron, and averaging about 1 oz. per ton in gold. The ore occurs in three parallel vein systems, 1200 to 1500 ft. apart, in diorite. On one of the series of veins is the property of the Keating Gold Mining Co., of which Jesse B. Roote, of Butte, is general manager, and C. W. Pritchett, of Denver, consulting engineer. It is developed from two 500-ft. shafts, both of which are to be sunk 200 ft. deeper. The hoists and air-compressor are operated by steam, but as soon as the electric power line, now under construction, is finished from Boulder to Radersburg, all machinery will be electrically operated, the electrical equipment necessary to make the changes having been ordered. The ore-shippments from the Keating have been about two carloads per day for several months; during the last few weeks the ore shipped is said to have averaged \$27 per ton; prior to that it was considerably lower. Recent work on one of the veins has opened a high-grade streak of copper ore, equally high in gold; this copper streak occurs side-by-side with the regular gold-bearing iron sulphide. Buildings, equipment, and development planned for next year will call for the expenditure of \$100,000. M. D. Graves is mine superintendent. Among those most heavily interested in the property are Jesse B. Roote, Butte; R. B. Dear, Superior; Julius Barnes, Duluth; James McKee, and C. W. Newton, of Butte.

The other most active properties in the district are the Ohio-Keating and the Black Friday. The latter is being operated by the Montana Leasing Co., concerned in which are Nelson Bennett and associates of Helena. The development here has opened a shoot of ore that runs \$100 per ton. The ore shipped in the last year sold for \$85,000. The Ohio-Keating is sinking its shaft deeper, and operating hoist and air-compressor with gasoline engines. The country rock contiguous to the diorite is dolomite, and in it there is some prospecting and exploration. The ore is shipped to the East Helena plant of the A. S. & Co., and to the Butte Reduction Works, at both of which a low treatment charge is made on Radersburg ores, on account of their desirability as fluxing material.

The August mine at Landusky, and the Ruby Gulch mine at Zortman, both situated in the Little Rockies, 60 miles south of Dodson on the Great Northern, are new and successful gold properties. The August has produced \$340,000 since March 1, 1909, as the result of operating its crushing mill and cyanide plant at the capacity of 100 tons per day. The ore consists of a gold-bearing quartz-porphyry, mixed with fluorite and containing some tellurides. It is said to have averaged \$27 per ton, the recovery having been \$20. The principal metal in the tailing is said to consist of silver. The ownership of this property is divided, one-half belonging to the Ruby Gulch Mining Co., and the other half to William and Robert Coburn, and Louis Goslin. The Ruby Gulch Mining Co., controlled by Whitcomb & Phillips, operates a mill and cyanide plant that treats about 9000 tons of ore a month, that runs \$4 per ton in gold, the extraction being about \$3.60 per ton. Its gross production for 1909 will amount to \$350,000, approximately. The two mines are ten miles apart, and both are developed by means of adit levels.

The Northwestern Metals Co., organized by M. L. Hewett, S. T. Hauser, A. E. Spriggs, A. W. Burwell, and C. C. Titus, of Helena, and C. B. Stetson, C. H. Innes, P. F. Wood, and H. A. Nash, of Massachusetts, has made plans for a reduction plant of 100 tons capacity, which it is proposed to erect at Helena early next year. The purpose is to utilize the Baker-Burwell ore process of extracting gold, silver, lead, and copper which are associated with zinc sulphide. Those concerned in the project are interested in mines yielding

ores of this character in the vicinities of Elkhorn, Wickes, and Corbin.

The Boston & Alta Mining Co., whose work on the old Alta mine, close to Corbin, is in charge of C. C. Titus, is sinking a new shaft, which has attained a depth of 325 ft. The plan is to sink 1000 ft., then run cross-cuts to the old Alta workings from which a great deal of silver, lead, and gold was taken in earlier days.

DENVER, COLORADO.

Oil Boom at De Beque.—Coal Situation.—Recent Transfers of Property.—Clear Creek News.—Timber Preservation.—Reports from Cripple Creek.

The long deferred oil boom at De Beque in Mesa county is on. There have been two wells in the vicinity giving small quantities of oil for a number of years. As soon as the United States Geological Survey engineers issued a preliminary report on the district, the possibilities of the field became apparent, and speculators began to assemble. Two drill outfits are at work, and new leases are being granted every day. The operators in the northern coalfields have raised the price 50c. per ton on domestic fuel. This is causing considerable adverse criticism throughout the State. It is reported that the A. S. & R. Co., and allied interests, have purchased a large tract of coal land near Hayden. There is a strong possibility that the Federal Government will bring suit against the State of Colorado to recover some valuable coal lands in Routt county, which are alleged to have been acquired through misrepresentation. The site of the old Grant smelter in East Denver is being sold, piece-meal, to various railroads to be used for terminal purposes. Recently the Burlington has secured two and one-third acres, and the Union Pacific 15 acres. The Yukon group of 50 claims, on Boulder mountain, about three miles north of Silverton, has been sold by the Boston & Silverton M. Co., to W. B. Lowe. This is the largest mining deal of the year in this district. The St. Paul and St. Patrick claims near Georgetown have been transferred to the Lake Superior & Nevada Development Co. for \$10,000. This property formerly produced high-grade gold ore. The present owners will undertake development to find the main orebody. The Clear Creek district is active. More than 50 men are working over the old placers around Idaho Springs. Some good pay is being taken from the creek bottom near the Stanley mine. The Tanguay Mining company has installed new equipment in the Lincoln mill, and now has the plant in steady operation. The Phillips raise has at last connected the old Seven-thirty shaft with the Burleigh tunnel. The flow of water was not as large as might have been expected, because the shaft had been filled for some distance by lessees.

The preservation of mine timbers is being taken up by the United States Forest Service with several of the large mining companies. These furnish to the Service the kinds of timber which are available at the mine. After treatment and use the Forest Service will recommend a type of plant and methods of applying that preservative which will be most economical. If a company desires to act upon these recommendations the Forest Service will assist in the design of the plant, and will instruct the employees of the company in its operation. Further information can be obtained from the Denver office. The unusual amount of snow and the shortness of the month of November combined to lower the monthly production of the Cripple Creek district about 4400 tons below that of October. The total output was 59,215 tons, having a gross value of \$1,284,487. The heading of the Deep Drainage tunnel is now some 700 ft. into the granite under Beacon hill, and one of the main water courses may be penetrated any day. During the month large and rich orebodies have been uncovered in the lower workings of the Golden Cycle and Vindicator mines. Work has been resumed on the Prince Albert tunnel, where it had been suspended, while the Worcester system of ventilation was being installed. With a pressure of 2 oz. per sq. in. no trouble is experienced with the gas, even when the barometer is low.

LONDON.

Tin in Nigeria.—St. John del Rey.—New Found Out.

The tin resources of Nigeria have been attracting attention in London recently. Under the régime of the Niger company the tinfields of Bauchi province have been investigated and the railroad and steamboat facilities provided by the company have encouraged English prospectors. Oliver Wethered and his friends have this month formed a company called the Nigeria Tin Corporation with a capital of £100,000 to operate in that country. It was Mr. Wethered who was the active spirit in introducing London money for Dolcoath ten years ago. As co-directors on the present board he has a director of Dolcoath, another of Tronoh, and two officers of the Phoenix, so that the board is well versed in tin mining. No properties or options have actually been acquired, but there is plenty of business in prospect. Nigeria has long been known as a tin producer and the natives have washed the gravel and smelted the concentrate. The district where the gravel is found is too far inland for it to have been an attractive spot for English operations, but since the Niger company first took an interest in the subject some seven years ago, the extent of the deposits has been more accurately appreciated. The Niger company has done much development in the Narguta district in the Bauchi province, and in spite of the fact that only native washing appliances have been employed, as much as 500 tons of concentrate was exported during 1908. Hitherto the difficulty of transport has stood in the way of active development. At the present time a railway is being built from Baro, a town on the Niger, toward the Bauchi province, and trains are already running over 100 miles. By next June the total length of 216 miles should be completed. As an instance of the occurrence of this gravel it may be mentioned that a new district is reported where the gravel runs 3 lb. per cu. yd. in the upper wash, with 2 ft. of bottom wash running 10 to 60 lb. per cu. yd. News also is published that a lode rich in tin and copper has recently been found. Of the nominal capital of the company £75,000 is now being issued, and the whole of it, except the usual preliminary expenses of company formation will be available as working capital.

The St. John del Rey Gold Mining Co. has issued a report for the half-year ended August 31. At the Morro Velho mine 96,021 tons of ore was raised. Of this 4521 was sorted out and 91,500 sent to the 120-stamp mill. The production was bullion realizing £196,005, or £2 2s. 10d. per ton. Of the yield per ton £1 11s. 6d. came from the battery and 11s. 4d. from the 'No. 2' process. The total extraction was 87.15% of the assay value of the ore. The yield was about 3s. 10d. per ton greater than during the previous half-year. The working cost at the mine was £131,949, development £5703, London expense £1925, taxes and charges £9917. Out of the profits £2729 went to debenture interest, £5292 to the 10% preference shares, and £19,271 to the ordinary shares, being at the rate of 8d. per £1 share for the half-year. In addition £20,709 was transferred to capital account for new works. Since 1901 no less than £201,496 has been transferred from profits to capital account for expenditure on new work, and it is desirable to spend at least another £70,000 for the purpose of completing the Peixe electric-power plant and certain tunnels and a shaft. The directors have decided, therefore, not to pay off any more of the £77,970 outstanding bonds, but to convert them into second preference shares bearing interest at 10%. As regards the resources of the Morro Velho mine, it is reported that the lowest or sixteenth 'horizon' is opening up well, and that above this level the reserves amount to 860,000 tons, or over four years' supply. The tube-mill recently provided is still being run experimentally with a view to finding the most suitable lining. One of the most interesting ventures in connection with this company is the installation of an electric furnace for the production of iron and steel direct from the ore. Iron ore is plentiful, but iron and steel have been a serious item of expense to the company. The furnace is giving satisfaction and it is expected that its success will induce the Government to do something to develop the vast resources of iron ore at their disposal.

One of the newly developed properties in Rhodesia under the wing of the Consolidated Gold Fields group has recently been floated as a separate company. This is the 'New Found Out', which is near the Giant mine, in the Hartley district, 68 miles from Salisbury. The flotation was undertaken by the Enterprise company, which is controlled by J. and S. Well, and the Consolidated Gold Fields of South Africa. The latter's consulting engineer in Rhodesia, H. A. Piper, has reported on the property and considers that development has been carried far enough to warrant the expenditure of £65,000 on equipment, shaft-sinking, and further development. The formation is ferruginous sandstone which is heavily mineralized and contains much pyrrhotite and some arsenopyrite. The gold is finely divided and fine grinding will be necessary. Experiments are being made with a view to finding out the best metallurgical process of treatment. The developments have been pursued along the ancient workings, and sinking and driving to the extent of 3500 ft. have been done. The 70 and 250-ft. levels have been opened up, and a third level at 375 ft. has entered payable ore. Though the ore has not been blocked out, Mr. Piper considers that the existence of 33,000 tons, valued at 10.6 dwt., may be assumed.

NEW YORK.

*Metal Markets Active.—Copper Producers Report.—Mining Shares.**—Montezuma, of Costa Rica.—Tajo de Dolores.—Cactus Development Co.—Cobalt.*

In the metal markets, with the exception of tin and lead, nearly all lines are reported dull and unchanged. Tin reached a new high level for the year during the week, mostly on foreign demand, the price reaching \$32.15 per lb. for spot tin, as against the London quotation of £146 5s. per ton. The lead market is reported much stronger, having scored an advance of ten points, reaching 4½c. per lb. Spelter is steady with Mexican ores beginning to come into the market.

The official report of the Copper Producers' Association for December 1, showing the production and consumption of copper in the United States for November and the stocks on hand on December 1, compares with the two previous months, as follows. All figures being in pounds:

| | November. | October. | September. |
|-------------------------|-------------|-------------|-------------|
| Stocks | 153,003,527 | 153,509,626 | 151,472,772 |
| Production | 121,618,369 | 124,657,709 | 118,023,139 |
| Total | 275,127,995 | 276,130,481 | 253,655,704 |
| Domestic deliveries ... | 66,857,873 | 66,339,617 | 52,105,155 |
| Exports | 55,266,595 | 56,261,238 | 50,077,777 |
| Total consumption .. | 122,124,468 | 122,620,855 | 102,182,932 |
| Stocks remaining | 153,003,527 | 153,509,626 | 151,472,772 |

This report is much less encouraging than was anticipated. When the report of 30 days ago showed a decrease of over 2,000,000 lb., buyers, for a couple of weeks, came into the market more rapidly than during any month in the year with the exception of the one month of August when the decrease was some 32,000,000 lb. Now, however, it is quite apparent that buyers are again waiting and until some definite news of the large plans supposed to be under way in copper is announced, there will be little doing in the copper metal market.

The mining share market has been quiet during the week. The retreat which was in order after the rendition of the Standard Oil decision was followed by a waiting period during which the Eastern financial situation stood at attention awaiting the message of the President to the Congress just convened. The evident intentional avoidance by Mr. Taft of any utterance that could be deemed unsettling has served to re-assure financial interests and a strong upturn with a prevalent feeling of renewed confidence is at hand. The financial event of the past week, one of the most important indeed in recent years, was the purchase of Thomas F. Ryan's interest in the Equitable Life Assurance Co. by J. P. Morgan. While a strong undertone is plainly apparent, it is also quite evident that

business activity will not get into full stride until after the turn of the year. In metals this condition is especially true. Copper, which for the past year has been the centre of public attention in a large measure, is at a standstill. The buyers that came into the market upon news of the expected copper merger have ceased their activity now that plans are for the time side-tracked. Various steps are being taken in preparation for the merger, the most important being the deals whereby the Utah Copper Co. takes over the Boston Consolidated, with Ohio Copper probably included, and the purchase of a large interest in Miami by the Greene-Canaan. Neither of these has been wholly consummated, but it is accepted as certain that they will be in the near future.

The affairs of the Montezuma, of Costa Rica, a low-grade gold property, the shares of which are held largely throughout the East, have been attracting some attention. At a recent meeting of the stockholders, Mr. Johnson, the president, reported that the company was without funds and was indebted to him for some \$53,000 for loans advanced to carry on the work. S. F. Shaw, the new manager, made a report showing that the mills were operating satisfactorily and making a saving of 85 to 95%, but the real trouble seemed to be that the ores are too low in grade to admit of profitable treatment. Work is to be carried on for three or four months under Mr. Shaw's direction by way of experiment to test the possibility of saving a profit.

Walter Harvey Weed and Frank H. Probert, of New York and Los Angeles, have completed their examination of the Tajo de Dolores mine at Guanajuato, Mexico, made for the Proprietary Mines Company of America. The report computes the ore in sight at 388,000 metric tons, worth \$1,388,000, net. The Mines Company of America, operating the Creston-Colorado, at Minas Prietas, Sonora, Mexico, reports that the ore which it has been treating at its mill for the past month is running some 30% better than for any like period during the last quarter. There has been a report current that the company has opened a large body of ore of good grade, assuring several years of added life for the property. Unfortunately, confirmation of the report cannot be had from any authoritative source.

A report recently made for the Calumet & Hecla interests on the properties of the Cactus Development Co., near Globe, Arizona, is said to have been favorable. Horace J. Stevens writes to a friend in New York concerning the property: "The Cactus has excellent prospects of making at least as good a mine as the Miami, while developments to date warrant the prediction that it should develop into one of the very largest copper mines of the world." Cobalt figures as to production show that the records of previous years are already broken, but the camp furnishes little in the way of sensation at present. A campaign has been made soliciting the proxies of the Cobalt Central stockholders to be turned over to Adolf Lewisohn. Mr. Lewisohn has taken occasion to state that he never agreed to assume responsibility for the company's affairs.

TORONTO, CANADA.

Ontario Mineral Output.—Cobalt News.—Technical Education.

A large increase in the mineral and metallurgical output of Ontario is shown by a statement issued by the Provincial Bureau of Mines, covering the nine months ended September 30. The total value is given at \$16,763,742, as compared with \$12,185,511 for the corresponding nine months of 1908. The largest item is silver, the output of which amounted to 18,751,549 tons, valued at \$9,385,600. The shipments of ore from Cobalt amounted to 22,218 tons, as against 17,335 tons, the proportion of concentrate being considerably larger, so that the silver content of the shipments exceeded those of the same period last year by 6,170,089 oz. Other notable increases were in iron ore and pig-iron. The output of the former amounted to 205,262 tons of the value of \$473,770, an increase of 39,174 tons, while pig-iron was produced to the amount of 294,698 tons, valued at \$4,095,735, an increase of 105,411 tons. Shipments from Cobalt have since been well maintained, consignments for November amounting to 2447 tons. Among the few recent accessions to the list is

the Beaver which is now working in a vein of rich ore 12 in. wide on the 250-ft. level. The Nova Scotia is increasing its capital stock by \$500,000 the issue being offered to shareholders at 50c. in proportion to their holdings. The engineer's report presented showed that 1,600,000 oz. silver had been blocked which was expected to yield the first year about \$60,000. A cyanide and amalgamating mill is under construction which it is hoped will be ready by spring. Underground operations at the Green-Meehan have been resumed after a cessation of some months, and will be carried on throughout the winter. Development is to be vigorously pushed at the 200-ft. level, where some good discoveries were made. Operations have been retarded by the delay in furnishing electric power, which was expected to be procurable some time ago, but cannot be had before spring. The annual meeting of the Ophir was held at Cobalt on December 6, the financial statement showing \$116,000 in hand. Since the installation of the plant last June 1000 ft. of stripping has been done, disclosing four well mineralized veins. The shaft is now down 210 ft., and about 90 ft. of driving has been done on the 100 and 200-ft. levels. The Union Pacific has reached a depth of 125 ft. in the shaft on their Peterson Lake leasehold, and will sink to 200 ft. before cross-cutting. The Gifford Extension has its main shaft down 200 ft. with a 10-ft. sump. A contract has been let for 300 ft. of cross-cutting to reach a big 27-in. vein cut by diamond-drilling and afterward tapped at the 80-ft. level. Three good veins have been struck in the first 26 ft. of the cross-cut. The annual statement of the Coniagas shows \$128,477 cash on hand, and \$151,971 value of ore under treatment. The dividend payable amounts to \$120,000. At the Trethewey a concentrating mill with a capacity of 100 tons of ore per day is in course of construction and is expected to be ready in the spring. There are 45,000 tons of milling ore on the dumps, estimated to be worth over \$450,000, and the ore in sight is estimated at between 5,000,000 and 6,000,000 oz. The O'Brien mine, at Miller lake, in the Gowganda district, previously known as the Gates' property, has made two important finds recently. At 42 ft. in the cross-cut at the 100-ft. level from No. 2 shaft, a 6-in. calcite vein, carrying high silver content, was struck, from which ore is being taken. Another vein 2 in. wide of high-grade ore has been found in the east drift from the cross-cut.

Eugene Haanel has been notified of the proposed erection in Norway of a second electric smelting furnace by H. Boholm, director of the Cobber Mine & Smelter Co., of Trondhjem. The latter has requested Mr. Haanel to recommend some metallurgist capable of taking charge of the erection and management of the works, which is a noteworthy recognition of the work done by the Canadian Mines Department in perfecting the system. Technical education is receiving considerable attention at present both from commercial and industrial bodies and professional educators. It is fully recognized that Canada is considerably behind other countries in this important matter. The question came up in the Canadian House of Commons recently when Hugh Guthrie, M. P., moved a resolution favoring the appointment of a commission of enquiry to investigate the needs of Canada in respect to technical education, and report as to ways and means. He intimated that he brought up the subject at the request of the Canadian Manufacturer's Association, and the Trades & Labor Congress, and that it had the support of numerous boards of trade and other representative bodies. Expressions of opinion were almost unanimously favorable, but Mr. Mackenzie King, Minister of Labor, on behalf of the Government, brought up the objection that there might be a constitutional difficulty in the way of action by the Federal Government, the matter of education falling under the jurisdiction of the provincial governments. He urged that the Government must have time to consider this and other aspects of the case and moved the adjournment of the debate. This being carried practically shelves the proposal for the present. The constitutional objection comes rather late in the day considering that the Government has repeatedly made grants for educational purposes. But Canadian politicians are adepts in the art of 'how not to do it'.

General Mining News.

ARIZONA.

COCHISE COUNTY.

The November output of the Copper Queen smelter was 9,400,000 lb. copper, a slight increase over the October production. Throughout the month there was an average of $8\frac{1}{2}$ blast-furnaces in operation and 6 converters.—The Calumet & Arizona smelter turned out 4,500,000 lb. of copper with 4 blast-furnaces and 5 converters in November. The directors of the company declared a dividend of \$1 per share.—The Fairview Mining Co. has been incorporated to open a group of claims near Johnson. A shaft is down 100 ft. on the property and a contract let for an additional 100 ft. of sinking.—The adit at the property of the Bisbee Copper Co., three miles from Bisbee, is in 170 ft., and has cut three veins of silver-lead ore. Ralph Ingram, the manager, states that the company will drive a 2700-ft. adit to open the ore at depth.—Operations are to be resumed at the Red Cloud group, in the Dragoon mountains, and a shaft sunk several hundred feet. Frank Briggs is manager.—The Bisbee Coalition company is building a road to its property four miles from Bisbee and will install a boiler and compressor. R. J. Clark is manager.—At the Morrow and Chamberlain group, in the Paradise district, the shaft is down 142 ft., and the company will continue sinking till the 200-ft. point is reached and then cross-cut to the contact.

GILA COUNTY.

(Special Correspondence).—Work on the Cactus is progressing at the rate of 1000 ft. per month.—The plan of development is to cut the property into 200-ft. squares with the levels established 100 ft. apart. G. W. Pritchett is general manager and consulting engineer and T. W. Hamilton superintendent.—At a depth of 84 ft. the Jennie shaft of the Cordova Copper company's property in the Miami district has opened a sulphide orebody, assays from which place the copper average at 2%.—About 95 men are being employed on the property of the Inspiration Copper company which is now in charge of T. R. Drummond.—The Scorpion shaft is not at present in ore owing to the fact that the copper-bearing body dips sharply to the south and away from the shaft. At a depth of 275 ft. a cross-cut will be driven from the shaft to strike the orebody.—Two Star churn-drills are now at work on the property of the Boston-Miami Development company in the Miami district. Fred W. Hoar, of Globe, is superintendent.—At the annual meeting of the stockholders of the Superior & Boston Copper Co., held at the mine office in Copper Hill, December 6, the board of directors that has served for the past year was re-elected. The financial statement for the fiscal year ending September 30, 1909, showed the balance of cash on hand to be \$298,544. The expenditures for the past year have been \$673,453. The receipts were \$679,155.

Globe, December 11.

MCHAVE COUNTY.

The latest discovery made a few days ago in a large open-cut at the Bi Metal mine, three miles south from Kingman, almost insures its purchase by John Hays Hammond. Rich stringers of a hematite ore containing gold were found traversing the entire face; one of these is 18 in. wide, and assays from 15 to 72 oz. gold per ton.—The Golden Gem mine at Cerbat has been sold to an Eastern company, and the surrounding Vanderbilt, Flores, Columbus, Broken Hill, and Idaho mines have also been examined, and will, in all probability, be taken over.—In the San Francisco district the Ruth mine has been sampled for A. L. White & Co., of Lima, Ohio, who have a limited option on the mine.—George Hartman has bonded his claims in the Tom Reed district, to a party of Nevada men for \$50,000. Sinking will be started at once.—On the Klondyke mine, in the Virginia district, 6 ft. of \$6 free-milling ore were cut on a parallel vein several hundred feet from the main workings at a depth of 30 ft., while sinking for water.—L. D. Godshall, general manager of the newly acquired interests of the United States Smelting, Refining & Mining Co., has just

ordered 16 gasoline hoists to be used in developing some of the recent purchases.—A new orebody was opened by the drifts on the 300-ft. level of the Golconda mine while driving to connect the shafts. The company paid its fourth dividend of 1c. per share December 11.—Four Nissen stamps have been ordered for the Dixie Queen mine in the Virginia district, and a mill will be erected shortly.

PIMA COUNTY.

The Southern Belle group, ten miles from Oracle, has been taken over by a group of California men, and will be re-opened. There is a large mill on the property and considerable development was done in the mine before it was closed down about 15 years ago. F. L. McPherson will be in charge of operations at the mine.

YAVAPAI COUNTY.

The Arizona Power Co. has contracted to supply the Alvarado Mining Co. at Congress Junction with electricity for the mine and mill and is building a line from Prescott to the mine.—The Arizona Placer Co. has made the last payment on the Wagoner property at Walnut Grove and is to commence more active development.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—Mining engineers, believed to represent Colorado capitalists, examined the Eureka mine a few days ago. The Eureka has been idle for 30 years, but was formerly a noted producer. Mrs. Hettie Green, of New York, is the heaviest stockholder.—The Bunker Hill has reduced its monthly dividend to 4c.—Sinking at the Kennedy is progressing steadily. The vein is being opened at the 3300-ft. point, but development has not progressed sufficiently to determine its size or value.

Jackson, December 13.

(Special Correspondence).—Two Austrian miners were injured in the Keystone mine at Amador City by an explosion caused by tamping powder in machine-drilled holes with an iron spoon.—In the complaint of the Kennedy Extension Mining Co. in its suit against the Argonaut Mining Co., the former states that the Argonaut company has mined \$500,000 worth of ore from a vein that apexes in the Muldoon ground which the latter is operating, and asks that the value of this ore and \$200,000 exemplary damages be paid by the Argonaut company.

Amador City, December 13.

CALAVERAS COUNTY.

A 40-hp. G. W. Price Pump & Engine Co. gasoline engine is being installed at the Horswill Deep Gravel mine between Valley Springs and San Andreas to operate the hoist and pump. F. A. Horswill is superintendent.—Operations have been started for the winter at the Moosehead gravel mine near Sheepranch. Edward Rigney is at the head of the enterprise.—Operations have been suspended at the Washington mine on Indian creek.—Some good gravel is being opened at the old Benson mine near Northbranch.

KERN COUNTY.

(Special Correspondence).—The Kern Development Co. has completed its 3-compartment shaft to the old workings of the Big Blue and Summer mines and is about to commence activities. In addition to these mines the North Extension Summer, Lady Belle, Beauregard, Fronk, Bull Run, and Urbana, will be operated through the new working avenue. Eastern people are interested. R. L. Long is superintendent.—Oscar G. Rogers, of this county, has taken a lease and option for \$40,000 on the McCreadle group of claims in the Amalie district.—Tungsten mining in a small way continues active in several districts.

Bakersfield, December 10.

MARIPOSA COUNTY.

The adit at the Hite Cove mine opened a shoot of rich ore. There are 35 men working at the property.—The shaft at the Champion mine has cut several streaks of high-grade ore.—R. O. Reick found a \$5000 pocket near Coulterville.—Joseph Kolbak is to install a 2-stamp mill on his claims on Saxon creek.—The Mountain King Mining Co., operating a group of claims eight miles above

Bagby, on the Merced river, are building living quarters for the men and are planning to enlarge the mill.

MONO COUNTY.

The Gray Butte Mining & Milling Co., operating southwest of Benton, is to start a new adit that will give about 300-ft. depth on the vein. The samples from a number of open-cuts and short adits have shown the vein to be 6 ft. wide, and to assay from \$14 to \$45 per ton.

NEVADA COUNTY.

(Special Correspondence).—The shaft at the Empire is going down rapidly. Four machine-drills are running on three shifts.—The adit at the Le Duc is in 850 ft. A narrow seam of quartz has been cut and it is expected to intersect the main vein within 30 days.—The 5 by 15 ft. vertical shaft at the Brunswick is down 115 ft. C. A. Mallen is superintendent.—At the Idaho-Maryland, development is principally on the 500-ft. level.—The 300-ft. adit at the Twin Sisters has cut a body of milling ore. Assays are reported to be about \$15 per ton. George Harty is superintendent.—Good ore is coming from the 300-ft. level of the Austin.—At the Pittsburg the shaft is going down rapidly. The mill is running steadily on ore from the 400-ft. point.—It is rumored that the management of the Murchie is contemplating an early resumption of activities.

Grass Valley, December 13.

Supplies are being hauled to the Gold Canyon mine at Moore's Flat and operations are to be resumed at once. Charles W. Smith is superintendent.—The drift at the

stalled. As soon as this installation has been completed the company will install machine-drills in the mine.—Operations have been suspended at the Oakland mine owing to the heavy snows.

TRINITY COUNTY.

The Trinity Dredge Co. has been organized to build a dredge on the Trinity river near Lewiston. The company owns 60 acres of rich gravel and a water-right from which it will generate power to operate the machinery. E. L. Smith will be in charge of the work.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Charter-Raton Mining & Milling Co., operating on Breckenridge mountain, has purchased from J. R. Gemmill the Louis B. and J. J. claims. The LaMoe adit has been advanced for 1250 ft., and the veins of these claims lie only a short distance ahead of the present breast. J. J. Bonner is manager.—W. M. Cooper, manager for the Capital Mining & Milling Co., operating on Griffith mountain, is doubling the capacity of the 125-ton concentrating plant. The basement is being enlarged and 12 Card tables will be placed in position during the next week.—Cavanaugh & Co., of Silver Plume, have taken a lease on the Vulcan mine on Sherman mountain.—The chemical laboratory at the Malm chemical-electro plant was started last week. S. A. Ionides, chemist in charge, is now sampling ore from several mines.

Georgetown, December 11.

(Special Correspondence).—The Almaden Mining Co., operating in Spring gulch, has secured the Shaffer group of 9 claims. With these holdings the company controls 24 claims, giving it possession of all property lying along the course of the Blazing Star adit for a distance of 3000 ft. A. R. Comstock is manager.—J. W. Boyd has secured control of the Lexington mine and a force of men is now employed in placing the workings in condition preparatory to shipping.—Work was resumed last week upon the holdings of the Crown Syndicate Mining Co. in the Lamartine district. F. Lally is in charge.

Idaho Springs, December 10.

GILPIN COUNTY.

(Special Correspondence).—The Slide property at Russell gulch is being unwatered and the shaft will be sunk to the 300-ft. level.—R. Pearce & Co., of Nevadaville, have taken a lease on the Missouri property.—During the month of November the Frontenac Mines Syndicate shipped 2000 tons of ore. Of this amount 1800 tons was treated at the company mill, the balance being sent to the Modern smelter. It is stated that henceforth the output will be at least doubled. H. P. Lowe is manager.—The Denver Quartz Mill & Crusher Co., is to build a 75-ton mill to handle custom ore.—The Milton property on North Clear creek is being cleaned out and re-timbered.

Central City, December 10.

LAKE COUNTY.

Operations have been again started at the old Dolomite shaft in the Leadville district and a 100-hp. boiler installed by the lessees. The shaft is down 400 ft. and it is the intention of the present operators to cross-cut on that level.—There has been considerable activity in Half Moon gulch the present season and plans have been made to drive an adit in the spring that will cut the ore at depth.—At the Progressive mine on North Fryer hill the drift on the lowest level is being driven south to open the shoot recently found on the level above.—The New Jersey Zinc Co. is shipping 75 tons of zinc ore per day from the dumps of the A. Y. & Minnie mine.—Local men have secured a lease on the Hopemore claim and have shipped three lots of ore to different smelters.—The face of the Yak tunnel is beyond the Resurrection No. 2 shaft and will be soon under the Diamond ground.—Nine carloads of silicious ore per month are being shipped by lessees from the No. 2 Penn shaft.—The Printer Boy shaft has been cleaned out and re-timbered and the lessees are now driving in ore.—The Bald Mountain Mining Co. is to sink 200 ft. from the adit level and cross-cut the vein.



Trinity County, California.

Oustomah, which recently opened the ore on the 900-ft. level, has been driven 90 ft. on the shoot, the vein widening to 2 ft. A raise will be started from the end of the drift shortly. The 10-stamp mill is running steadily on good ore.—Operations have been started for the winter at the Jefferson gravel mine near Remington hill. E. K. Benchley is in charge of the work.—Some high-grade ore is being opened on the lowest level of the Red Ledge mine near Washington.

SHASTA COUNTY.

A \$28,000 gold bar was brought to Redding as the result of the monthly clean-up at the Midas mine at Harrison gulch. L. A. McIntosh is manager for the company which is working 110 men.—Erik O. Lindblom has purchased the Milkmaid mine at French Gulch from the Western Exploitation Co. for \$300,000. There are five claims in the group which has been worked from 1857. The mine was closed down in 1898 and remained idle till two years ago when it was bonded by H. F. Musser and re-opened.

SIERRA COUNTY.

The compressor and power plant has been hauled to the Gray Eagle mine at Gold Point and are now being in-

OURAY COUNTY.

It is reported that the Bright Diamond mine, north of Ouray, has been sold and that the new company is considering plans for the erection of a smelter.—The old workings at the Wedge mine have been re-timbered and the operators are now ready to begin shipping.—A rich vein of silver ore is being opened at the Black Girl mine under lease to Fred Herzinger.

SAN JUAN COUNTY.

At the Bonner mine, in the Silverton district, G. Crossman is installing an Ingersoll-Rand compressor and stope-drills, General Electric 100-hp. motor, three No. 7 and three No. 5 Leyner drills. The value of the ore is about \$50 per ton, though it is complex, containing considerable zinc.—At the Homestake mine belonging to James McNamara, on Mineral creek, a 9-ft. vein that assays \$29 per ton is being opened. Two feet of the vein is high-grade ore going over \$50 per ton.—Two streaks of high-grade ore were cut by the raise in the Thunder Fairview property. George H. Bibb is manager.

TELLER COUNTY.

A sub-lease on the Conundrum mine has been secured by S. A. Worcester, of Victor, on a 25% royalty basis.—The Jerry Johnson Mining Co. paid \$25,000 dividends on December 15. This is at a rate of 1c. per share. The Elkton Consolidated will distribute \$50,000 or 2c. per share on December 24.—The lessees of the Kitty Lane property have opened a good body of ore on the 250-ft. level and are installing an electric hoist.—A new orebody has been opened on the third level of the school land operated by the School Section Leasing Co., and several cars of ore shipped that assayed from \$18 to \$24 per ton.—The November production of the Vindicator Consolidated company was a little over 3000 tons of ore having a bullion value of \$100,000.—The Alabama Mining & Leasing Co., operating the Pharmacist mine on Bull hill, has opened a new orebody 100 ft. south of the shaft. During November the company shipped 240 cars of \$20 ore.—The United Gold Mines Co. has declared a dividend of 1c. per share amounting to \$40,000 to be distributed on December 20.—Gilder, Stetson & Williams, of Victor, representing Chicago capitalists, have secured an 18 months' lease on the Last Dollar mine on Bull hill.

IDAHO.

IDAHO COUNTY.

At the American Eagle mine, near Elk City, under lease to A. W. Boyd, a small force is at work underground getting the old workings in shape for production and opening new ore. The mill will not be started till spring.—At the property of the Dixie Royal Mining Co. two veins have been opened this season and it is probable that the company will erect a mill in the spring.

MICHIGAN.

The first weekly shipment of ore by the Lake Copper Co. produced even better results than the test run made a few weeks ago. In the trial run 80 lb. of mineral per ton of rock was obtained as compared with over 82 lb. in the present shipment, while the amount of refined copper was 59.33 lb. as against 60.9 lb. in the last run. The ore for the test was taken from various parts of the mine that have been opened with a view to obtaining a fair idea of the average value.—The New Baltic Co. has drilled into an amygdaloid vein for a distance of 105 ft., equal to about 75 ft. in cross-section, all showing some copper and 7 ft. of exceptionally rich. Articles will be filed at Lansing for the incorporation of the New Baltic Copper Co., with 100,000 shares, \$25 par. No arrangements have been made as yet for floating the new company. In Section 12 the exploration diamond-drill has made no progress since November 5 on account of caving ground necessitated frequent cementing.

MONTANA.

SILVER BOW COUNTY.

(Special Correspondence).—W. A. Clark, owner of the United Verde copper mine in Arizona and several large mines in Butte, appears to be in opposition to the proposed

copper merger because of his mining troubles, or threatened troubles, with the Amalgamated company over mining rights in the Butte district. It is a notorious fact that the Clark copper, produced in Butte, costs more per pound than any other turned out in the district, chiefly because of old and antiquated methods still in use at his plants. Clark has recently purchased a large tract of land at Bearmouth, together with a large water-right and it is reported that he intends to build a smelter there, presumably to treat the ores of that district.—The Tuolumne Copper Co. has ingeniously met the claim that it is mining on the Jessie vein of the North Butte company, which it is opening from the 1000 to the 1400-ft. level, close to the south-side line of the Jessie claim. When it was first charged that the Tuolumne was trespassing on the North Butte vein, a strenuous denial was entered and the claim set up that the vein worked by the Tuolumne was an independent vein having its apex in the Tuolumne ground and had no connection with the Jessie vein. Later the Tuolumne miners, in working on the vein in question, broke into the workings of the North



Anaconda Hill, Butte.

Butte on the Jessie vein. Now Tuolumne admits that it is the Jessie vein, but claims the vein belongs to Tuolumne ground, and that instead of having its apex all the way in the Jessie claim, it crosses the south boundary line of that property and for more than 900 ft. is entirely within the Tuolumne claim. The North Butte people had contended that the apex was so far north of the Tuolumne that there was no question about its occurrence on the Jessie claim. Now, however, the Tuolumne people put the issue up clearly that it is a question of the ownership of the apex and on this the controversy will probably be fought out. No action has yet been brought to determine the rights of the parties, but both are active in making developments and surveys preparatory for the legal fight that seems inevitable.

Butte, December 11.

NEVADA.

CLARK COUNTY.

A contract has been let to sink the shaft on the Big Six property, near Searchlight, to the depth of 175 ft. James Wilson is manager.—Kerby & Gaines, the lessees on the Good Hope group, have opened a streak of rich ore at a depth of 25 ft., and a hoist will be installed.—The Quartette Junior company is to resume sinking at an early date.

ESMERALDA COUNTY.

The Pittsburg-Silver Peak Mining Co. is adding 20 stamps to its mill and is arranging to pipe water from the Valcalda property to the town of Blair.—W. F. Gray and associates have secured a five-year lease on the Gold Bar claim of the C. O. D. Consolidated company, at Goldfield, and will erect a 50-stamp mill on the property.—There are several sets of lessees operating on the Atlanta ground, and it is hoped to find the extension of the Clermont vein.—In the Daisy all the ground has been leased and about 25 tons per day of \$30 ore is being hauled to the mill.—A 15-hp. gasoline hoist has been placed on the Goldfield Banner lease on Booth ground and the shaft unwatered. Cross-cuts will be driven from the 150-ft. level and if the ore is not found at

that point the shaft will be sunk an additional 100 ft. and the ground prospected from that level.

LANDER COUNTY.

(Special Correspondence).—The Austin-Manhattan is opening excellent ore in the Frost shaft and Jack Pot mine.—L. D. Mills, of the C. W. Merrill Co., of San Francisco, is conducting experiments in the old mill prior to the erection of the new plant.—The lessees on the Peerless report the opening of a 2-ft. vein of \$120 ore.—F. L. Judd and associates, of Cleveland, have purchased a group of claims in New York canyon. The same people are working the Patriot and Roosevelt and will drive an adit on the True Blue claim to cut the Patriot vein.—The Mennis lease at Bannock reports the uncovering of bonanza ore. The shoots are narrow, but the ore assays well.—French capitalists have become interested in the Galena group of 16 silver-lead claims and are planning to drive a 3000-ft. adit to unwater the property and provide water power for a large mill. E. G. Labadie is manager.

Austin, December 9.

NYE COUNTY.

(Special Correspondence).—The mill of the Tonopah Extension is rapidly nearing completion, and it is now thought that the plant will be in operation by February 1. John G. Kirchen is manager.—Midway is opening new ground in the north portion of the 435-ft. level. Nearly 200 tons per week are being sent out from the upper workings.—The Hargrove-Bell lease on the Diamond Queen reports the uncovering of a 2-ft. vein averaging \$311 per ton at a depth



Montana Tonopah, Goldfield.

of 100 ft.—The Mayflower has opened a 3-ft. body of \$25 to \$66 ore on the 400-ft. level.—The District Court of Nye county has ordered that the Solid Gold mill, at Round Mountain, be deprived of the waters of Shoshone creek, as far as relates to the Daisy water rights, and establishes the rights of Round Mountain Fairview to 2465 in. of water from the creek. The Fairview mill will resume operations within a short time. It is expected that sufficient surplus water will be developed to enable the Daisy to continue the steady operation of its Solid Gold plant till spring.—The Manhattan Mining & Leasing Co. is to start its Canyon mill. Ore from the Little Grey and Eagle claims will be handled at first.—The Four Leaf has commenced the washing of gravel at the Gold Pan and Fairview claims. The shaft is down 93 feet.

Tonopah, December 11.

The Montana Tonopah company is doing considerable development work on all levels of the mine, especial attention being paid to the western part of the property in order to pick up the extension of the Triangle vein.—On the Sand Grass claim of the Tonopah Mining Co. a 3-compartment shaft is to be sunk to the 2000-ft. point and the claim prospected from that depth. This shaft will be 2000 ft. west of the Red Plume shaft, which at present is the most westerly working on the property. On the 1500-ft. level, the company has installed a diamond-drill.—One carload of ore

per day from the development work at the MacNamara is being shipped to the Balaklala smelter at Coram.—Frank Peterson and associates sent 500 tons of ore to the War Eagle mill from their lease on the Stray Dog mine at Manhattan.—On the Swanson lease on Earl ground the lessees have the shaft down over 150 ft., and are stoping on the 100 and 150-ft. levels. There are approximately 1000 tons of ore on the dump that will average \$20 per ton.—A run of 400 tons from the Rose-Nash lease, on Union No. 4, was put through the War Eagle mill. The ore assayed from \$12 to \$20 per ton.—The Round Mountain Mining Co. is to pay its seventh dividend of \$32,000 December 20. This is at the rate of 4c. per share. The mill is running steadily, treating 110 tons of ore per day, and it is understood that the company is to increase the capacity in the near future.

WHITE PINE COUNTY.

(Special Correspondence).—Five steam shovels are working at Copper Flat on the Nevada Consolidated, three stripping the ore, two loading it into the railway cars.—The new working shaft of Ely Central on the Eureka fraction is going down at the rate of 100 ft. per month. It is expected to cut the leached porphyry at a depth of 350 ft., and enter the sulphide near the 400-ft. point. Keystone drilling will be started 200 ft. south of the new shaft on the Eureka fraction, Quartette, and Weber claims.—The Giroux Consolidated has completed the drilling of a 1035-ft. hole on the Rickard claims reported to have been in ore the greater part of the way, with much native copper in the core. A second hole has been started and will be followed by a third. It is said that the hole cut a body of commercial copper 100 ft. thick at a depth of 800 ft.—Ely Consolidated has resumed work at two shafts and expects to commence early operations at the third.—Federal Ely is to resume work.—The shaft at the Boston-Ely has cut the sulphide ore and the management of the company is planning for more extensive development. Edward W. Ralph is superintendent.

Ely, December 11.

OREGON.

JOSEPHINE COUNTY.

Charles A. McKinnon, of Grants Pass, sold his group of claims in the Sucker Creek district to Max Kuhn for \$10,000. There are a number of rich properties in this district though no extensive mining has been done since early days.—A Pelton water-wheel and 3-drill compressor have been installed recently at the Oriole mine in the Galice district, and electric equipment will be added in the near future. Four drifts have been run on the vein and several shipments of the high-grade ore shipped to the Tacoma smelter.—I. J. Merrill, of Portland, has taken over the Big Four, formerly known as the Judson placer mine, on Pickett creek. The work at the mine will be in charge of C. D. Crane.—At the Mountain Lion mine, seven miles west of Murphy, the management is installing electric amalgamating apparatus in the 5-stamp mill. T. J. Brinkerhoff is superintendent.

UTAH.

JUAB COUNTY.

The stockholders of the Little Chief company have turned their stock over to the Chief Consolidated company at Tintic, and are now shareholders in the larger concern. The Chief Consolidated is now shipping six cars of rich silver ore per week.—The Black Jack mine, one of the Knight properties, at Mammoth, has been closed down temporarily. The Opohongo company which is operating through the Black Jack shaft will continue shipping, keeping the hoist and compressor running.—Two cars of zinc ore were shipped from the Scranton mine in North Tintic to the Bartlesville plant and lead ore is being sent to the American Smelting & Refining Co.—The Golden Chain Mining Co. has taken over the ground of the Ajax company in the Tintic district.—Operations have been suspended at No. 1 shaft of the Iron Blossom company on account of the unfavorable rate paid by the smelters for the low-grade copper-silver ore.—A 35-ft. cross-cut from the shaft on the 100-ft. level of the Grutli property opened a body of low-grade lead-silver ore.—Lessees at the Provo are opening

some good ore and have been assured by the management that they will be granted an extension of their lease which expires next March.

SUMMIT COUNTY.

The Little Bell company, operating in the Park City district, has declared a dividend of 5c. per share, payable December 22.

SALT LAKE COUNTY.

Jesse Knight and E. R. Woolley, of Salt Lake, have purchased the Taylor & Brunton sampler at Murray for \$250,000.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The New Republic Co. reports having started shipments of ore from the Tom Thumb mine, under lease from the Midget Gold Mining Co. The ore goes to the British Columbia Copper Co.'s smelter at Greenwood, British Columbia.—At the Lone Pine, the lessees are shipping to the smelters from 70 to 75 tons of ore per week, which assays about \$20 per ton.

Republic, December 9.

OKANOGAN COUNTY.

(Special Correspondence).—The Palmer Mountain Tunnel, Power & Development Co. has suspended work in driving the adit ahead, and placed a diamond-drill in the adit. A contract to bore 1000 ft. into the hill, the completion of which will give a depth of about 1700 ft. below the surface, has been let.—An option held by S. C. Emmons and S. S. Callahan on a group of five claims on Goat creek, in the Upper Methow country, for \$15,000, has been taken up. Three shafts and two adits on the property have each developed gold and copper-bearing ore of payable value.

Loomis, December 9.

SNOHOMISH COUNTY.

J. Edward Spurr has completed an examination of the Monte Cristo mine for the Guggenheim interests and it is understood that they will purchase the property and start the Everett smelter in the spring. The Monte Cristo mines were the main supply of arsenic ore to the smelter before the Monte Cristo Mines & Metals Co. suspended operations.—Only two cars of ore per month are being shipped from the Wayside mine at Granite Falls on account of the heavy flow of water found on the 850-ft. level which has been recently opened. The ore contains copper and gold, and has a gross value of about \$50 per ton.

STEVENS COUNTY.

(Special Correspondence).—An important discovery in the Chewelah district has been made in the main adit of the United Copper mine, 1800 ft. in from the portal, and at a vertical depth of 450 ft., where a body of high-grade copper ore 6 ft. wide has been found. Two machine drills are in operation. A new adit has been started and new living quarters for the miners are under construction.—Carbonate and sulphate copper ore have been found in the upper adit of the Amazon mine, 160 ft. in from the portal and at a vertical depth of 121 ft.—The main adit on the Windfall mine is in 634 ft., and a contract has been let for another 100 ft., with the expectation of tapping the vein before it is finished. A good quality of ore has been mined in the upper workings.—Against the hanging wall of an 8-ft. vein in the Snowstorm mine, in the Fish Creek district, the International Mining & Milling Co. has opened a 15-in. streak of chloride of silver ore from which samples give an average assay of 1200 oz. silver per ton.—A vein 62 ft. wide is being opened on the Slate Creek group of claims, by the Metaline Mines, Ltd. The company has let a contract to drive a 300-ft. adit.—The Oriole Mining & Milling Co. is installing a 6-drill compressor plant and will continue sinking the main shaft during the winter.—On the Gypsy group of claims, 12 miles northeast of Metaline, a 4-ft. streak of ore in a vein 150 ft. wide, is being explored. It assays about \$60 per ton in gold, silver, and copper.—An assessment of one mill per share has been levied by the Bornite Mining & Smelting Co.—The Germania Mining Co., operating near Deer Trail, has received concentrating machinery for its tungsten property and will install it im-

mediately. The mine has been closed several months, but operations will now be resumed.

Metaline, December 11.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The Davenport Coal Co. has been organized to work the old property of the East Crows Nest Coal & Coke Co., seven miles east of Frank. It is said there are about 8,000,000 tons of bituminous coal available on the property.—At the Deep Mine, Ltd., the management is planning a 3-compartment 550-ft. raise, with stations, and drifts from them on the orebody.—A rich find of free-gold has been made on the old I. X. L. ground in the western part of the Rossland camp, by Brokenshire & Evans, the present lessees. The vein is 2 ft. wide.—The diamond-drills have cut some good looking ore in the Le Roi and driving is now being done to more fully develop the finds. On the Josie claim of the Le Roi No. 2, Ltd., the shaft will be sunk only another 50 ft., to the 1350-ft. level, when the work of opening the ore-shoots from the 950 downward will be started.—No shipments were made from the Oro Denoro property of the B. C. Copper Co. during the week, but the shipments from the Mother Lode were somewhat above average. The B. C. Copper Co. is holding over 1,500,000 lb. copper for higher prices.—The eighth and last big furnace at the Granby smelter was blown-in last week, completing the work of augmenting the eight furnaces begun early in the year. The capacity of the smelter was increased about 1000 tons per day thereby.—Diamond-drill exploration has been started on the Rawhide mine of the New Dominion Copper Co. This is the first work that has been done on the property since the old company closed down.—A 20-in. galena vein was cut in the Argo tunnel at Greenwood last week 260 ft. from the portal.—The Crescent mine-compressor plant is being moved to a point near the Phoenix-Greenwood adit and machine-drills will replace hand work in a couple of weeks.—A 10-ft. vein of ore containing gold, silver, and copper, assaying from \$15 to \$20 per ton, was opened in the shaft on the Tip Top last week.—Diamond-drilling is in progress on the Massett coal areas, Queen Charlotte island. The B. C. Amalgamated Coal Co. is behind this work.—At the Red Cliff mine, in the Portland Canal district, the compressor and power building has been completed.—The Big Casino group of 6 claims, adjoining the Red Cliff, was sold recently for \$75,000, 10% down.

Rossland, December 10.

ONTARIO.

One ton of ore per day is being shipped from the development work on the 250-ft. level of the Beaver mine in the Cobalt district, and it is the intention of the management to erect a new power plant.—Drifts driven on the No. 5



McKinley-Darragh Mine, Cobalt.

Lawson vein, on the 80-ft. level, have opened shoots with a high percentage of smaltite and a connection will be made with the No. 8 shaft.—Considerable interest is being shown in the Porcupine district and a number of sales have been recorded.—A dividend of 5% has been declared by the McKinley-Darragh-Savage Mines, Ltd.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

J. H. CURLE writes from Teheran.

F. LYNWOOD GARRISON is in San Francisco.

R. S. RAINSFORD has been in San Francisco.

RALPH ARNOLD was in San Francisco this week.

GEORGE G. DIXON has gone to Liberia, West Africa.

C. W. PURINGTON has returned to London from Siberia.

W. M. BREWER, of Vancouver, was at New York recently.

JAMES BROWN is at the Hotel Stewart in San Francisco.

DONALD F. CAMPBELL has returned to London from Germany.

C. ALGERNON MOREING has returned from the Black Sea region.

FREDERICK H. HATCH returns to London in December from Natal.

AUGUSTE MATHEZ has opened an office at 42 Broadway, New York.

A. McARTHUR JOHNSTON, of Johannesburg, is on a visit to England.

THEO. F. VAN WAGENEN has returned to Zacatecas, Mexico, from Colorado.

C. B. KINGSTON is returning to the Rand, after a visit to England and Canada.

GEORGE L. MACKENZIE, of London, passed through San Francisco this week.

J. POWER HUTCHINS is in London, on his return from the eastern coast of Siberia.

ALLAN GIBB, resident engineer for the Tanganyika Concessions, has arrived in London.

J. MORGAN CLEMENTS passed through San Francisco Thursday on his way to Mexico.

ROBERT LINTON has been appointed manager for the Sierra Mining Co., in Chihuahua, Mexico.

J. A. TAFF has resigned from the U. S. Geological Survey to take a position with the Southern Pacific.

HENRY M. LANCASTER, mining engineer, Wallace, Idaho, has been taking a trip to Pacific Coast points.

ERNEST A. HAGGOTT is making a business trip to Globe and points in Mohave and Yuma counties, Arizona.

JOHN P. COSGRO, southwestern representative of Allis-Chalmers Co., is in Chicago on a brief business trip.

P. C. JUES is making a trip through several of the Western States in the interest of the Union Iron Works Company.

FRED T. WILLIAMS, of Park City, Utah, was in San Francisco this week, returning from a wedding journey to Hawaii.

F. W. HARBORD has been engaged by the Transvaal Government to report on the coal and iron resources of the Transvaal.

THOMAS PASCOE, recently manager of the Mount Boppy mine, in New South Wales, has opened an office at 509 Salisbury House, London.

IRVING ANDERSON, of the engineering firm of G. Scott Anderson & Son, Wallace, Idaho, will soon visit the mining districts of western Nevada.

CLIFFORD WILFLEY has been appointed superintendent for the Virginia & Mexico Mine & Smelter Corporation in place of P. R. WHITMAN, resigned.

C. A. BOHN, for a number of years in the smelting department of the A. S. & R. Co. in Mexico, has changed over to the mining department of the same company and will be with S. W. Eccles, vice-president of the company, in New York.

THE San Francisco Section of the Mining and Metallurgical Society of America will meet at the Palace Hotel, San Francisco, at 6:30 p.m., December 20, instead of 15, as announced last week.

Market Reports.

LOCAL METAL PRICES.

San Francisco, December 16.

| | | | |
|--------------------------|------------|--------------------------|---------|
| Antimony | 12-13½c | Quicksilver (flask)..... | 50½-51 |
| Electrolytic Copper..... | 15½-16½c | Spelter | 7½-8½c |
| Pig Lead..... | 4.85-5.80c | Tin | 34-35½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|--------------|----------------------|-------|----------|-----------------|
| Dec. 10..... | 13.25 | 4.45 | 6.26 | 52 |
| " 11..... | 13.25 | 4.49 | 6.26 | 52 |
| " 12..... | Sunday. No market. | | | |
| " 13..... | 13.25 | 4.50 | 6.26 | 52½ |
| " 14..... | 13.25 | 4.50 | 6.24 | 52½ |
| " 15..... | 13.25 | 4.50 | 6.24 | 52½ |
| " 16..... | 13.25 | 4.57 | 6.24 | 52½ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Dec. 9. | Dec. 16. |
|------------------------|---------|----------|
| £ s. d. | £ s. d. | £ s. d. |
| Camp Bird..... | 1 8 6 | 1 7 6 |
| El Oro..... | 1 5 7½ | 1 5 10½ |
| Esperanza..... | 2 15 7½ | 2 15 0 |
| Dolores..... | 1 8 9 | 1 8 9 |
| Oroville Dredging..... | 0 10 9 | 0 10 9 |
| Mexico Mines..... | 6 7 0 | 7 5 0 |
| Tomboy..... | 0 19 4½ | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

Closing Prices.

December 16.

Closing Prices.

December 16.

| | | | |
|-------------------------|-----|---------------------------|-----|
| Adventure..... | 6 | Mohawk..... | 61 |
| Allouez..... | 56 | North Butte..... | 56½ |
| Atlantic..... | 11¼ | Old Dominion..... | 61½ |
| Calumet & Arizona..... | 100 | Osceola..... | 155 |
| Calumet & Hecla..... | 650 | Parrot..... | 29½ |
| Centennial..... | 87 | Santa Fe..... | 2½ |
| Copper Range..... | 81½ | Shannon..... | 16½ |
| Daly-West..... | 8½ | Superior & Pittsburg..... | 16 |
| Franklin..... | 16 | Tamarack..... | 66 |
| Granby..... | 101 | Trinity..... | 10 |
| Greene-Canaan, etc..... | 12 | Utah Con..... | 44 |
| Isle Royale..... | 26¼ | Victoria..... | 4 |
| La Salle..... | 16½ | Winona..... | 11¾ |
| Mass Copper..... | 6¾ | Wolverine..... | 145 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, December 16.

| | | | |
|---------------------------|-------|----------------------------|------|
| Atlanta..... | \$ 10 | Mayflower..... | \$ 4 |
| Belmont..... | 65 | Midway..... | 20 |
| Booth..... | 11 | Montana Tonopah..... | 92 |
| Columbia Mtn..... | 5 | Nevada Hills..... | 70 |
| Combination Fraction..... | 46 | Pittsburg Silver Peak..... | 69 |
| Dalay..... | 9 | Rawhide Coalition..... | 16 |
| Fairview Eagle..... | 12 | Rawhide Queen..... | 16 |
| Florence..... | 2.75 | Round Mountain..... | 58 |
| Goldfield Con..... | 8.10 | Sandstorm..... | 5 |
| Gold Keweenaw..... | ■ | Silver Pick..... | 8 |
| Great Bend..... | 3 | St. Ives..... | 8 |
| Jim Butler..... | 10 | Tonopah Extension..... | 51 |
| Jumbo Extension..... | 14 | Tonopah of Nevada..... | 7.35 |
| MacNamara..... | 31 | West End..... | 23 |

(By courtesy of the San Francisco Stock & Exchange Board.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. | | Closing prices. | |
|-------------------------|------|---------------------------|-----|
| December 16. | | December 16. | |
| Amalgamated Copper..... | 87½ | Miami Copper..... | 20½ |
| A. S. & R Co..... | 101¼ | Mines Co. of America..... | ½ |
| Boston Copper..... | 21¼ | Montgomery-Shoshone..... | 1½ |
| B. C. Copper Co..... | 7½ | Nevada Con..... | 26½ |
| Butte Coalition..... | 29½ | Nevada Utah..... | 15½ |
| Cumberland-Ely..... | 9¼ | Newhouse..... | 3½ |
| Davis-Daly..... | 4½ | Nipissing..... | 10¾ |
| Dolores..... | 7 | Ohio Copper..... | 6 |
| El Rayo..... | 2¾ | Ray Central..... | 2½ |
| Ely Central..... | 1½ | Ray Con..... | 22½ |
| First National..... | 6¼ | Superior & Pittsburg..... | 16½ |
| Giroux..... | 107½ | Tenn. Copper..... | 88 |
| Guanajuato Con..... | 1½ | Trinity..... | 10 |
| Inspiration..... | 8¼ | Tuolumne Copper..... | 3½ |
| Kerr Lake..... | 7½ | United Copper..... | 7½ |
| La Rose..... | 4¾ | Utah Copper..... | 60½ |
| Mason Valley..... | 1½ | Yukon Gold..... | 47½ |

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

HANDBOOK OF BRITISH GUIANA, 1909. Edited and compiled by George D. Bayley. Published under the authority of the Permanent Exhibitions' Committee. Dulau & Son, London; J. H. Stark, Boston, 1909. Price \$1.20.

An energetic publicity campaign is being conducted by the Crown Colony of British Guiana to attract settlers and capital. Recently we reviewed the handsome and interesting volume on the geology of that country published to that end. We now have before us a comprehensive handbook which affords a description of the country, its climate, geology, flora, fauna, and products, together with statistics covering every detail of industrial life. It is a volume of 607 pages, octavo, beautifully printed and illustrated with a map and many handsome photogravures. There is an interesting historical review by James Rodway, and a résumé of the geology by J. B. Harrison. With the agricultural resources we have little to do, though it may be said in passing that the opportunities seem to be exceedingly great, especially in the cultivation of cacao and rubber. The great obstacle to agricultural development has long been the want of labor. The effort of the Colony is to secure independent workers who shall own the land, to which end homesteads are limited to five acres. This seems excessively small, especially considering that nine-tenths of the total area of the country remains unappropriated. There is a hint, however, of extraordinary productive capacity of the soil involved in the small acreage of the homestead claims. The population is estimated at 304,000. The area is 690,000 square miles, and 147,851 acres is under cultivation. The climate is unusually healthful for the tropics, the death rate of 30 per 1000 being accounted for to a large extent by excessive infant mortality among the poor.

Mining activity cannot be considered great. The total recorded output of gold has been 251,801 oz., of which 45,462 has been yielded by quartz mines. The bulk of the remainder has come from crude washing of alluvial gravels, mostly with the long-tom. The Barima mine has yielded 7796 oz. gold, and is now erecting a mill of fairly large proportions. The Guiana Gold Concessions, Ltd., has a mill of 15 stamps, and in the last 3½ years has produced 28,549 oz. The Guiana Gold company has been operating a dredge for over two years on the Konawaruk river, a tributary of the Essequibo, and has turned out 6976 oz. gold within that period. It is now erecting a second dredge. The Handbook insists upon the possibilities of extensive dredgeable areas in the Colony. Prospecting licenses are issued at \$5 per year, giving the holder the right to locate any number of claims 1500 by 800 ft. Claims are held under a rental system of \$5 each per annum. No extralateral rights on veins are conceded. Exclusive prospecting permits for three-year periods are issued on payment of a fee of \$10, and a yearly tax of 7½c. per acre for the area embraced within the concession. Still larger areas may be taken up for prospecting on 99-year permits on payment of a nominal fee and a tax of 20c. per acre per year. Dredging concessions are granted in the same manner, on the payment of 10c. per acre yearly. A royalty is collected on all gold produced, amounting to 70c. per ounce. The full text of the mining law and regulations is given in the Handbook. Timber licenses may be obtained on areas not exceeding 2000 acres. A rental is collected amounting to \$5 for any area less than 500 acres, and \$10 for tracts of larger dimensions. In addition the Government collects a royalty on 'greenheart' or other hardwoods of 0.7c. per cu. ft. Other timber with a specific gravity of not more than 0.7 is subject to a royalty of 0.5c. per cubic foot, and firewood pays 8c. per cord.

A TREATISE ON MASONRY CONSTRUCTION. By Ira Osborn Baker. 8vo., pp. 762, tables, ill., index. John Wiley & Sons, New York, 1909. Price \$5.

The tenth edition of this standard work is before us, recast in all essentials for bringing it up abreast of the times.

The principal additions are in connection with concrete construction, as might naturally be expected. Mr. Baker's book contains a review of cement testing and mortars which makes it one of the best guides for cement users in existence. The subject of limes, cements, and concrete occupy 222 pages of the present treatise. On the engineering side the important new matter consists of a chapter on the elastic arch, that is, "one which is considered to support its load by virtue of the internal stresses developed in the material." Any voussoir arch, whether made of stone or brick, will act as an elastic arch as long as the line of resistance remains within the middle third of every joint, that is to say, as long as no tension is developed. Also any arch, whether voussoir or monolithic, will act as an elastic arch as long as the maximum tension does not exceed the safe tensile strength of the mortar or the elastic limit of the concrete. The author discusses the conditions for an arch having fixed ends, developing the subject mathematically, and he then considers the effect of temperature-changes, temperature-stresses, and stress due to shortening of arch-ring, followed by an exposition of the method of approximate solutions. Next comes a discussion of the reinforced concrete hingeless arch. In connection with this Mr. Baker succinctly epitomizes the advantages of reinforcing, in the following words. "Even though the economy in the use of steel in arches is not great, the reinforcement is practically of great value. Concrete is much more reliable in compression than in tension, and hence the use of steel to carry the tension adds to the reliability of the structure as a whole. Further, the steel is an economical insurance against uncertainties in the data, errors in the computations, shrinkage stresses, unequal settlement of the foundations, defective materials, and careless workmanship." An appendix contains specifications for cement and concrete work, and for railway masonry. Those who know this splendid work need not be told that it is free from padding. It is a plain useful engineering guide within the department indicated by its title. There is no other book which so adequately covers this field, and whatever Mr. Baker has written may be accepted as proved up to the limit of present knowledge. It is invaluable as a text-book and as a guide to the constructing engineer.

BENSON'S COMPENDIUM ON MINES, MINING, MINERALS, ORES, ROCKS, WEIGHTS OF METALS AND ROCKS; EFFECT OF HEAT ON VARIOUS SUBSTANCES, ETC. By H. T. Benson. Pp. 105, ill., index. Hall & Williams; Denver, 1909. Price, \$3.

Regarding the Silurian age, in that portion of the book devoted to geology, Mr. Benson says: "200 to 300 feet of drab-yellowish or light-gray thin bedded limestone of dolomitic; by some fossil shells it is recognized to be Silurian. Here may be found indications of lead, silver, or other ores, but not much gold as a rule." The rest is similar.

BIBLIOGRAPHY OF NORTH AMERICAN GEOLOGY FOR 1908. By J. M. Nickels, U. S. Geol. Surv. Bull. 409. Pp. 148. Washington, 1909.

This useful little bulletin is in continuation of the series so long compiled by F. B. Weeks.

WATER RESOURCES OF THE BLUE GRASS REGION, KENTUCKY. By G. C. Matson, with a chapter on the QUALITY OF THE WATERS, by Chase Palmer. U. S. Geol. Surv., Water-Supply Paper. Pp. 223, ill., index. Washington, 1909.

GEOLOGY AND UNDERGROUND WATERS OF SOUTH DAKOTA. By N. H. Darton. U. S. Geol. Surv., Water-Supply Paper. Pp. 227, figures, map, index. Washington, 1909.

PLEISTOCENE GEOLOGY OF THE LEADVILLE QUADRANGLE, COLORADO. By S. R. Capps, Jr., U. S. Geol. Surv., Bull. 386. Pp. 99, ill., map, index. Washington, 1909.

GEOLOGY OF THE LEWISTOWN COAL FIELD, MONTANA. By W. R. Calvert. U. S. Geol. Surv., Bull. 82. Ill., map, index. Washington, 1909.

GRANITES OF VERMONT. By T. Nelson Dale, U. S. Geol. Surv. Bull. 404. Pp. 138, ill., index. Washington, 1909.

Silver, Copper, Lead, and Zinc in the Central States in 1908.

The Geological Survey has just issued a report on the production of silver, copper, lead, and zinc in the Central States in 1908, prepared by B. S. Butler and C. E. Sieben-thal from statistics received from the mines. The States covered by the report are Arkansas, Illinois, Iowa, Kansas, Kentucky, Michigan, Oklahoma, and Wisconsin. The mines in this group of States report a decrease in the production of these metals from that of 1907 amounting in value to \$21,370,754, or more than 27%, the figures for the two years being \$77,697,457 and \$56,326,703, respectively. The most notable decrease was in the production of copper, which showed a loss of \$14,079,602, or more than 32%, the figures for 1907 and 1908 being \$43,553,466 and \$29,473,844. Michigan was the principal copper-mining State in this group in 1908, the other States mining chiefly lead and zinc. Most of the silver produced is derived from ores that carry mainly copper or lead. The loss in lead production in these States amounted to \$2,633,850, or 17%, principally in Missouri, the chief lead-mining and zinc-mining State in the country. Illinois, Iowa, Kansas, Kentucky, and Wisconsin, however, also show greatly diminished lead production. The lead product of the Central States in 1907 and 1908 amounted to \$15,516,174 and \$12,882,324. The loss in zinc production in this section—\$4,595,436, or 25%—was divided among three States, Kansas, Missouri, and Wisconsin. The figures for 1907 and 1908 are \$18,411,086 and \$13,815,650. Notwithstanding the general loss in the production of these metals in the central section, some States show gains in output of one or more of the metals. Missouri gained in silver, Oklahoma in lead, and Arkansas, Illinois, Iowa, and Oklahoma in zinc. The report contains charts showing graphically the average weekly prices of spelter and of standard zinc concentrate in 1907 and 1908 and the weekly production of zinc concentrate in the Joplin region during those years.

Commercial Paragraphs.

The GOULDS MFG. Co., Seneca Falls, New York, has been given the highest award for triplex power pumps by the directors of the Alaska-Yukon-Pacific Exposition.

THE LUNKENHEIMER Co., Cincinnati, Ohio, tendered its employees and families a Thanksgiving dance in one of its new factory buildings November 24. About 3000 people attended.

CHALMERS & WILLIAMS, Chicago, report that they have recently received orders for a 5-stamp cyanide plant from Byron E. Janes, Durango, Mexico; three 60 in. by 22 ft. tube-mills from the El Oro Mining & Railway Co., El Oro, Mexico; Burt cyanide filter and tube-mill from Swatling & Smith, Pearce, Arizona; forty 6-ft. Frue vanners from the Caucasus Copper Co., Russia; and a 25-stamp mill for the Republic of Colombia.

THE CYCLONE DRILL Co., Orrville, Ohio, reports the largest business for the month of November in the history of the company. There is unusual activity in the purchase of drilling outfits for all purposes. Among the shipments for the month are the following: five drilling machines for blast-hole work for the Panama Canal, six blast-hole drills for the Rio Tinto company for railroad construction in Spain, a core-drilling outfit for Hayti, and a prospecting machine for the Southern Development Company.

A change of much interest has just taken place in the F. M. DAVIS IRON WORKS, of Denver. The company has been entirely reorganized and re-capitalized. By this change John S. Cary becomes president, Robert J. Cary vice-president, L. C. Spaulding secretary and treasurer, and R. B. McConney general manager. Mr. McConney has been manager for several years of the Denver district for Allis-Chalmers Co. and has resigned to become associated with the reorganized F. M. DAVIS IRON WORKS. His wide acquaintance and experience will assure the success of the new company. Mr. Spaulding has been with the old organization many years, and he and Mr. McConney have purchased the interest of F. M. Davis. They will have the active management of the company.

Platinum Production in 1908.

Platinum is produced in the United States only as a by-product in placer-gold mining in Oregon and California. The output in 1908 was 750 troy ounces, valued at \$14,250. This quantity was nearly double that produced in 1907, but the value of the product was only about 35% greater, owing to a decline in prices. During the last three years the price of this rare metal has fluctuated from \$18.20 to \$38 per troy ounce for the refined metal (the value of gold is about \$20.67 per troy ounce), and the amount of crude platinum or platinum ore annually imported into the United States, chiefly from Russia, has ranged from 4237 lb., valued at \$1,095,754, to 11,494 lb., valued at \$3,601,120. The oldest uses of platinum were based on its resistance to chemical action and its high melting point, properties that made it valuable for use in chemical laboratories in the form of crucibles and other vessels. During recent years it has been used in jewelry, for it is probably the best material available for mounting diamonds, and also largely in dentistry. It is also used in electric lighting and heating and in making sparking plugs for explosion engines. The most important industrial use of platinum is found in the sulphuric-acid industry. More than half of the sulphuric acid now made is manufactured by the use of platinum. A report by David T. Day on the production of platinum in 1908, has just been issued by the United States Geological Survey. The pamphlet contains abstracts from a report by W. Geibel on the platinum deposits of Russia and the metallurgy and uses of the metal, an abstract of a report on platinum in Colombia, South America, made by Jay White, consul general at Bogotá, and a description of newly discovered deposits of platinum ore in Nevada, by Howland Bancroft.

Dividends.

American Smelting & Refining Co., December 1, declared a regular quarterly dividend of 1¼% on the preferred stock, and 1% on the common stock.

United Verde Copper Co. paid, December 1, the usual monthly dividend of 75c. per share, making \$9 paid this year compared with \$6.75 in 1908.

The Federal M. & S. Co. paid \$210,000 on December 15, at the rate of 1¼c. per share on its preferred stock. This makes \$930,000 for the year, \$90,000 being paid on common stock.

The Tennessee Copper Co. resumed payment of dividends November 24 by the declaration of \$1.25 per share. More than a year has elapsed since the last payment was made, \$1.25 per share having been distributed in September, 1908.

The Old Dominion Copper M. & S. Co. (New Jersey company) has declared dividend No. 6 of \$1 per share, the same as three months ago, payable January 3 to stock of record December 14. The directors of the Old Dominion Co., of Malne, met in New York December 2, and declared a regular quarterly dividend (No. 8), of 50c. per share, payable January 4, to stock of record December 14.

Catalogues Received.

LIDGERWOOD MFG. Co., New York. Bulletin No. 7. 'Electric Mine Hoists.' Illustrated. 9 by 12 inches. 20 pages.

THE ATLAS CAR & MFG. Co., Cleveland, Ohio. Bulletin No. 1090. 'Electric Locomotives, Trucks, and Cars.' Illustrated. 6 by 9½ inches. 52 pages.

THE SLIMES TREATMENT Co., LTD., Box 1094. Nelson, British Columbia. Bulletin No. 1. 'The Natural Settlement Method of De-watering and Recovery of Cyanide Solution from Slime-Pulp.' Illustrated. 8 by 10½ inches. 12 pages.

JAMES BEGGS & Co., 109 Liberty street, New York. Catalogue No. 35, 'Feed Water Filtration.' A treatise on the removal of organic matter, sediment, lubricating oils, etc., from the boiler feed water in power plants, and on the removal of any matter in mechanical suspension in liquids. Illustrated. 6 by 9 inches. 32 pages.

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TABLE OF CONTENTS.

| | |
|---|-------------------------|
| EDITORIAL: | Page. |
| Notes | 843 |
| Christmas 1909 | 844 |
| Leasehold System for Mineral Lands..... | 844 |
| ARTICLES: | |
| Mining Methods and Costs at the Esperanza Mine.....W. E. Hindry | 846 |
| Davis Consolidated Hydraulic Mine..... | 849 |
| What Should an Engineer Know of Law?..... .....Courtenay De Kalb | 849 |
| Pressure Filtration | Ernest J. Sweetland 853 |
| Sodium Sulphate in San Luis Obispo County, Cali- fornia.....Ralph Arnold and H. R. Johnson | 855 |
| Are We Progressing?..... | S. A. Worcester 856 |
| Katanga Copper Belt..... | F. E. Studt 857 |
| Calorific Value of California Fuel Oil.. | R. W. Fenn 874 |
| A Primer on Explosives..... | 874 |
| Tungsten | 874 |
| DISCUSSION: | |
| American Merchant Marine.Theo. F. Van Wagenen | 858 |
| Researches Upon Cripple Creek Telluride Ore..... .....Frank G. Peck | 859 |
| CONCENTRATES | 860 |
| SPECIAL CORRESPONDENCE | 861 |
| GENERAL MINING NEWS..... | 867 |
| DECISIONS RELATING TO MINING..... | 873 |
| DEPARTMENTS: | |
| Personal | 872 |
| Market Reports | 872 |
| Publications Received | 873 |

EDITORIAL.

DIVIDENDS by the Bunker Hill mine in Amador county, California, have been augmented by a Christmas distribution. The statement in our news columns last week gave a wrong impression which we are pleased to correct.

CHINA has a duly accredited minister from the United States. Mr. W. J. Calhoun is in every way qualified for the place and will make a most excellent representative at Peking. His peculiar fitness was, however, only discovered by the politicians who control appointments in Illinois, on his making a striking speech of welcome to Mr. A. B. Cummings. The possibility of his leading the 'Insurgent' forces in Illinois was too great to be risked. The need for Mr. Calhoun at home is the only disturbing thought in connection with his appointment.

GERMANY is to hold an International Congress of Mining and related subjects in 1910. The meeting will be at Düsseldorf, June 20 to 23, and the program is to include discussions on mining, metallurgy, applied mechanics, and practical geology. Americans are cordially invited to take part. Particulars may be learned from Dr. Schrödter, secretary of the Verein Deutscher Eisenhüttenleute, or Bergassessor Loewenstein, secretary of the Verein für die Bergbaulichen Interessen im Oberbergamtsbezirk Dortmund.

ELECTRIFICATION of the mountain division of the Southern Pacific railroad between California and Nevada is to be immediately undertaken. Electric locomotives of larger size than any now in use will be employed. The length of road to be electrically operated is 135 miles, and the change will involve an expenditure of nearly \$4,000,000. A few more such enterprises would have a most beneficial effect on the copper market. Apparently the electrification of railroads will henceforward proceed with great rapidity, both East and West.

REPORTS of a great dredging enterprise on the Feather river, to recover gold, reclaim large areas of land for agricultural use, and in the end leave the river navigable twenty-five miles above Yuba City, are all too good to be true. We would like to believe it, but the general understanding is that a short distance below Oroville the river gravels drop off suddenly in value to five cents and less per cubic yard. The new corporation, which would serve so many beneficent purposes all at once, is incorporated in Arizona under the title of the Feather River Dredging & Concentrating Company. The announcement is made that suction dredges will be

used. The project bears the ear-marks of inexperience.

OCTAVO folios are the latest, the United States Geological Survey having begun to publish a field edition of the 'folios' of the Geologic Atlas, in the smaller size. This raises some question as to when a folio is not a folio, but the old name is probably too firmly fixed to be disturbed. The new form of publication will be welcomed by mining engineers and will greatly increase the usefulness of the maps of the Survey. Books 18 by 21 inches in size are not well adapted to carriage on horse-back and to frequent use in field. Any one who has tried to control a horse with one hand while reading from a folio held in the other, perhaps with rain falling and wind blowing, will welcome the new octavo folios, regardless of linguistic complications.

THIRTY YEARS of service as editor is a long period, particularly when the years have been spent in the service of one paper. Mr. Charles Kirchhoff, who retired this month from the position of managing editor of *The Iron Age* after such a term, has seen that paper grow mightily in wealth and influence, and he has contributed notably to its success. He has found time also for much good work aside from his editorial duties. His reports on lead, spelter, and copper, made for many years to the United States Geological Survey, are models of accuracy and fairness. In that they reflect the spirit of their author, a spirit which he, with the aid of his associates, breathed into our distinguished New York contemporary. To it and to Mr. Kirchhoff we extend not only the compliments of the season, but our good wishes for all time.

Christmas 1909.

Christmas is here, but whose stocking contains the profits from our 'lower' tariff is still under debate. At one time it seemed as if stockings themselves might be taxed out of use, but Mr. Cannon and Mr. Aldrich, perhaps with a vivid recollection of certain features of the Populist movement, got together and agreed to lower the proposed figures. The stockings are here, but some, alas, are empty. Zelaya is still looking for the dove of peace and a chance to spend in quiet the simple savings of a plucky life. Dr. Cook is looking for a less suspicious public, while Mr. Peary is looking for Dr. Cook. Mr. Hammond's stocking contains no vice-presidency this morning, and Mr. Ballinger's gapes for a vindication which won't rub off. It is currently reported, on the other hand, that Mr. Pinchot has a brand-new history of France and is re-reading the chapter on the return from Elba. Mr. S. F. Emmons has a whole stocking full of honorary degrees, while Mr. W. A. Caldecott and Mr. William Gowland each found a well deserved medal hidden down toward the toe. The Geological Survey, thanks to the unexplained opposition of Mr. J. R. Mann, has not received that new building whose angular corners it was hoped might by this time be seen distending the elastic lisle thread. The American Mining Congress is still hoping for that aid in getting a Bureau of Mines, which Santa

Claus Taft led it to expect. The American Institute of Mining Engineers had hoped for a stocking full of contributions to its funded debt. The Mining and Metallurgical Society had one stocking spread for a policy, and the other for a leader who could overcome inertia in the mass of its members. State geological surveys everywhere will doubtless leave their stocking pinned conspicuously to the mantel till the last legislator goes home, and the 'Copper Combine' will hope against hope, for a few days at least, that the congested condition of the mails accounts for the non-delivery of the package containing Government approval of its plans. The United States Steel Corporation is duly thankful for orders received and its stockholders for dividends paid. Many other stockholders have needed to hang only the baby's stocking this year, and yet there are notable exceptions. On the whole, 1909 has turned out better than was anticipated. The splendid record of the Goldfield Consolidated, to mention only one of the many, has enabled nearly five million dollars to find its way into various stockings. Many mining engineers who received from their clients nothing but Christmas cards bearing fine sentiments last year, have been better remembered this time and are appropriately cheerful. A general and welcome Christmas spirit is in the air.

Leasehold System for Mineral Lands.

Withdrawal of the phosphate lands from location until their character as lode or placer deposits might be determined has resulted in the introduction of a bill by Mr. Reed Smoot intended to unlock these valuable resources to normal development. The bill represents a frank concession to the principle of the leasehold, which has been advocated energetically by a growing number in what we might call appropriately the Conservationist Party. It is interesting in this connection to note that the leasehold formerly constituted the sole means by which mining land might be acquired and held on the public domain of the United States. After trying this for awhile in the lands acquired from Mexico, the American, with his instinctive love for independence, demanded that protection of his title which comes through patent. A leasehold is a grant, which accords a vastly lower order of possession than ownership in fee simple. The latter is a right which is not defeasible. To be sure, the failure to pay taxes works forfeiture to the State after due process of law. This has been likened to the royalty or rent payable as a condition for leasehold rights, but the difference is wide and deep. All claim to a leased property ceases and determines, as the lawyers say, immediately that the time of payment has passed, if the money has not been paid. We recall the case of a certain famous mine in Mexico which was stolen from its owners by the general manager, who craftily let the time for annual rental go by unheeded, but was not so careless in regard to re-denouncement. A fee-simple title, however, in a certain sense attaches the soil to the man. Only a decree of court can quiet title as against a former owner; failure to perform all the acts specified by law does not inherently cause instant sacrifice of his rights. There may be reasons

why a man cannot perform all that is required by law; the relations of rightful owners are sometimes so complex that the courts must determine the validity of respective rights and obligations.

It is needless to re-argue the matter at length, but we could safely predict that the world would be shaken with agrarian protests should it be seriously proposed to change patented rights in agricultural lands to the flimsier possessory form of leaseholds. It is questionable whether such substantial development would occur in a community holding property under a system of short-time leases, whether the owner be a land-baron or a national government. Examples are many. Historic in America is the feeble development of the vast Helderberg estate in New York until after the 'Van Rensselaer Rebellion' which compelled the granting of titles to the determined farmers. The relatively unimproved condition of the great ranches in the Southwest, where the work is done by tenants, on short time leases, as compared with areas split up among numerous owners, affords many a startling contrast. If it be objected that such tenants are liable to fluctuating rental, it may be said that the possibility of a change is present under a leasehold system, even when the grant issues from the Government, though it is customary for such changes to be made at times and in ways provided in the lease. These phases of the question appeared so important to the early miners of the West that the demand for ownership in fee-simple became one of the strong arguments which hastened the passage of a mining law providing for the disposal of the public mineral lands. It was one of the incentives which impelled John Sherman to draft the measure from which has come the fundamental mining law of the land. The force of the contention of the miners for substantial property which they might securely hold, or convey as other property is conveyed, appealed to the sense of justice in the hard-headed legislator, who saw financial advantages for the Government as well, in the proposed alienation of public lands.

As opposed to the view which prevailed when the mining law was enacted, a plausible argument is advanced. It is an argument which appeals primarily to that part of the population not directly interested in the exploitation of the classes of mineral land involved in the proposed changes. Instead of a flat-rate of so much per acre, the income would be proportioned to the assessed value of the property, as determined by its actual mineral content, and its natural advantages for exploitation. To some extent this principle has long been operative in relation to coal lands in the West. If the prime purpose in the administration of the public land be to gain as large a revenue as possible for the Government then the leasehold system offers a certain method for swelling the exchequer. If the public lands are to be utilized to reduce taxation for the maintenance of the Federal Government, and the 'people in congress assembled' do so enact, nothing remains to be said. It has been a settled conviction, however, that one part of the country should not be taxed for the benefit of another part, and the man in Idaho or Utah, paying generous royalties on phosphate lands

to help reduce the taxes for the wheat-grower in the Red River valley of Minnesota, and for the potato-grower of Maine, would likely feel that a certain injustice had been done in the expansion of this idea of public ownership.

There is no doubt, on the other hand, that such a system is a check upon private monopoly. It renders the locking up of large areas of mineral land economically impossible. It limits the absorption of holdings to those that can be utilized within a reasonable time. The same end could only be attained by appraisal of the lands in accord with their varying worth, and issuing patent to competent locators on application. It is with a view to control of monopoly that the movement for a leasehold system has arisen. Greed of corporations in the control of natural resources has become a peril so great that we join heartily in commending those faithful Government servants who would protect the rights of the whole people against infringement by a few. It is the proposition to depart from secure tenure in fee simple to the less firm right involved in a leasehold that makes one question whether it be wise. Mr. Smoot has given a new turn to the matter by introducing such a principle into the bill for taking up phosphate lands. If the system be extended from one mineral to another it is logical to suppose that it will ultimately be applied to all.

The leasehold system prevails over the larger part of the world; the majority is therefore against us. America, however, has until lately been a land where the individual right has been always exalted, and where the tendency toward strong centralization has been resisted. The leasing of public lands is one more expression of centralization, a tying of the man and the land more closely to the sovereign power. It takes from the pioneer the opportunity to absorb the unearned increment, except to the extent that is provided in his lease. We have seen how the prospector in the wilds of northern Ontario has had his chances of fortune lessened by a withdrawal of surrounding territory for re-appraisal as soon as announcement of his discoveries was made through filing on the land. The same thing occurred in this country when the phosphate lands were withdrawn from entry. We have protested against this, as any form of impairment of legal rights is abhorrent to Americans.

The question is many-sided, and there are many interests to be considered. The public is bigger than the individual, but that does not necessarily make its interest more vital. The public is but an aggregate of individuals, and in modifying the right of one, the rights of all are affected. Individual initiative is too valuable a national asset to be seriously jeopardized. The leasehold system has its dangers, and careful search should be made for a way to protect the national resources and prevent monopoly before calling back a system of land-tenure which has so long been alien to our thought and practice. The case of oil, which involves a substance which cannot be retained within territorial boundaries, is different. There the principle of leasing appears to insure as great justice to the proprietor as ownership in fee-simple.

MINING METHODS AND COSTS AT THE
ESPERANZA MINE.

Written for the MINING AND SCIENTIFIC PRESS
By W. E. HINDRY.

Ore breaking in the Esperanza mine was carried on under varying conditions as regards size of stopes and character of material broken. In the early days of the mine, the hanging wall portion of the San Rafael vein in the section south of the fault was worked and this was by all odds the most stable portion of the mine and value of the ore comparatively uniform. The stopes here varied from 6 to 40 ft. in width, with an average of some 25 ft. and the assay values were quite sharply defined between the shale hanging wall on one side and a zone of hard 'bull quartz' or a 'horse' of slate on the other. The lengths of the stopes on the various levels ran from 100 to 600 ft., this last being the greatest length of any single ore-shoot so far opened. North of the fault the ore masses were irregular, the width across the vein being at times greater than the length, as shown along the strike. The distribution of the gold was also very erratic. Some of these stopes had, at points where the vein swelled out, a width of 175 ft. and elsewhere narrowed down to 5 ft. In all cases the ground was excessively 'heavy' due to the fact that the calcium content of the shales oxidized or 'slaked' upon exposure to the air, with the result that a crushing force was exerted that no amount of timber could support. This was especially true of the ground north of the main fault where the vein itself was more shattered and less stable than in the south section.

The following is a statement of costs per wet metric ton of ore-breaking for several years, from which an idea can be formed of the expense attached to the various operations.

| | Ore production. | | Cost per ton. | |
|-----------------------------|-----------------|---------|---------------|---------|
| | 1904. | 1905. | 1906. | 1907. |
| Wet metric tons broken..... | 134,620 | 192,004 | 217,514 | 167,708 |
| Drilling: labor | \$1.58 | \$1.48 | \$1.75 | \$1.78 |
| Power | 0.04 | 0.04 | 0.06 | 0.04 |
| Pipe lines | 0.01 | 0.01 | 0.01 | 0.01 |
| Explosives | 0.08 | 0.13 | 0.16 | 0.15 |
| Tools and implements..... | 0.06 | 0.09 | 0.05 | 0.05 |
| Timbering: labor | 0.33 | 0.20 | 0.27 | 0.31 |
| Supplies | 0.85 | 0.94 | 0.92 | 0.91 |
| Repairs, labor | 0.13 | 0.31 | 0.38 | 0.26 |
| Repairs, supplies | 0.10 | 0.31 | 0.33 | 0.22 |
| Tracking: labor ..... | .... | .... | .... | .... |
| Supplies ..... | .... | .... | .... | .... |
| Drainage | 0.37 | 0.22 | 0.14 | 0.14 |
| Pipe lines | 0.01 | 0.01 | 0.03 | 0.01 |
| Lighting | 0.17 | 0.16 | 0.13 | 0.15 |
| Ventilation ..... | .... | .... | 0.03 | 0.04 |
| Assaying | 0.17 | 0.17 | 0.15 | 0.17 |
| Miscellaneous: labor | 0.04 | .... | 0.01 | 0.06 |
| Supplies | 0.01 | 0.01 | .... | .... |
| Maintenance: buildings and | | | | |
| surface improvements | 0.03 | 0.04 | 0.04 | 0.03 |
| Surface machinery.... | 0.18 | 0.19 | 0.18 | 0.23 |
| Underground machinery | 0.33 | 0.38 | 0.37 | 0.19 |
| Tools and implements. | 0.11 | 0.14 | 0.15 | 0.14 |
| Total | \$4.60 | \$4.81 | \$5.16 | \$4.89 |
| Mine to mine bins..... | 1.14 | 1.07 | 1.33 | 1.34 |

NOTE.—'Mine to mine bins' as given above is made up of costs of tramming and hoisting, these in turn including costs of labor, power maintenance, and so forth.

All stoping was done 'overhand' and at first square sets of 10 by 10 in. timber were used. It was found, however, that it would be impossible to hold the ground open for any distance in height without filling and therefore the size of the timbers used was reduced to 8 by 8 in., the sets being filled with waste immediately after the ore was removed. In the more solid portion of the vein in the south section it was found possible to mine considerable ore without the use of any timbers whatever, the ore being taken out in sections of 100 ft. in length along the vein. The 'cut' or slab of ore broken was some 15 ft. in height and it was shot down after drilling by machines. In this manner one 100-ft. section would be in process of being drilled preparatory to shooting; along a second the ore would be being removed, while a third was being filled with waste material.

As a result of the decomposition of the shale walls, a large amount of heat was evolved. In certain sections of the mine, even where the air circulation was free, stopes and drifts became excessively hot, and in the event of a stoppage of the air-current for even a short time, the heat became almost unbearable. Artificial ventilation had to be resorted to in many instances in order to enable the men to work.

In a general way, the scheme followed in the blocking out and handling of the ore was the same in all cases. Drifts were driven, usually in the foot-wall quartz, more or less parallel to the orebody to be mined. From these drifts cross-cuts were driven through the orebody; in the south section at intervals of 50 ft. This in the north section was subsequently increased to 20 m. From these cross-cuts, raises were put up on the foot-wall side of the orebody, outside of the ore itself, from level to level. These raises were of two compartments, one being used as manway and the other for handling both ore and waste, the waste coming into the stope from above while the ore was passed through the lower portion of the chute.

After completion of the raises and cross-cuts, the sill floor of the stope was broken out by driving a face the full width of the orebody from cross-cut to cross-cut, this being timbered with square sets as progress was made. In the meantime, at points opposite the raises, the first, second, and sometimes the third floors were also being opened, it being the general idea to keep the floors opposite the chutes opened to a higher level than the balance of the stope in order to facilitate the handling of the filling material. Where the stopes were unusually wide, chutes for the extraction of the ore were carried up with the stope and raises were driven from convenient points to be used as 'mill holes' for the handling of filling material from above. The 'waste' or barren material for the filling of the stopes was derived from various sources including: (1) the waste broken in development headings; (2) as the waste is not sufficient for the demand, waste from caving stations; and (3) when the case was urgent and no other waste material was immediately available, cross-cuts were driven into the hanging wall or foot-wall. The endeavor was usually made to drive these waste cross-cuts in such a manner that

they would serve as exploratory work in addition to the securing of filling material.

The caving stations were formed by driving cross-cuts or drifts in suitable places, where the caving of the ground would not affect any of the workings, to a considerable distance away from the vein. At the end of these cross-cuts a chamber was cut out and the ground allowed to cave, after which the only expense attached to the securing of the material was the cost of loading and tramping.

A standard square set was adopted, the timbers used being square sawed timber, 8 by 8 in., framed with the view to affording the greatest resistance to strains in the direction from which they usually came. The sets were 5 ft. square, centre to centre, and 7 ft. 6 in. high, also centre to centre. They were not designed as a permanent support for the ground, but simply to prevent any sudden movement while the ore was being removed. Not more than one floor was open at any one time, and it was rare that even this was true. The ground was so heavy that immediate filling was necessary in order to prevent serious accidents and as a rule, the filling followed close behind the breast where the ore was being

ground in the neighborhood of these west veins was heavier and harder to handle than that adjoining the main San Rafael vein, the result being that great difficulty was experienced in holding the main drifts open. Various expedients were tried in this connection, the final result being that the drifts were timbered with sets made of 14 by 14 in. timber, outside of which were placed 10 by 14 in. posts and caps with a block of 6 in. between the main and auxiliary sets. This permitted the 'easing' of the outer timbers and the lagging without greatly interfering with traffic, but even with this method, the frequent re-timbering of the drifts was necessary. The heat evolved from the decomposition of the shale walls was excessive and great difficulty was experienced in keeping the temperature of the stopes down to a point which permitted men to work. Where the natural circulation of air was not strong, artificial means had to be adopted, exhaust or pressure blowers driven by electric motors being used.

Three classes of ore were broken and handled, namely: shipping ores, sulphide milling ores, and oxidized milling ores. The first two mentioned were derived from the west veins, with the exception of



Esperanza Mine and Mill.

broken. Two-inch planking was used for flooring of the sets next to the ore breasts, this planking being removed prior to filling. No attempt was made to recover any of the timber of the sets themselves. Where necessary, gangways were left open, usually only for a short time. These were formed by lagging a row of square sets with 2-in. plank and filling in behind them. Chutes and 'mill holes' in the body of the stope were cribbed with 8 by 8 in. timbers, as were also the majority of the raises on the foot-wall, these being made in two compartments, each independent of the other in order that one side might be repaired while the other was in use. Where the ground was exceptionally heavy lagging was driven, but as a rule, this was not necessary. When occasion arose for quick action, solid cribs were built in the stopes for the strengthening of some particularly weak place. These cribs were built of square timbers—usually old timber derived from the renewal of drift sets, or shaft sets.

In the breaking of the ore from the west veins, which were relatively narrow, an attempt was made to use stulls and filling rather than square sets and filling, in order to reduce the timber costs. This was a failure and square sets were afterward used. The

a small quantity which was mined from the foot-wall body of the San Rafael vein on the levels 7 and 8. The oxidized milling ores or third class, formed the bulk of the production as regards tonnage, and were derived from the large orebodies of the San Rafael vein. The distribution of gold in the veins was erratic, more especially in the stopes north of the main Esperanza fault. This necessitated taking a large number of samples daily—from 300 to 400—and special gangs of men were employed in this work. A system of numbering the various raises and cross-cuts, was adopted. The numbers formed the basis of another system applied to the stopes, every square set being designated by its proper number, the result being that an exceptionally comprehensive system of assay plans and maps was evolved and kept up-to-date. The relation of the gold to the silver in the various parts of the mine was relatively constant so that assays were made for gold alone and the calculation regarding the lowest grade of ore to be broken based thereon. For the convenience of the shift-bosses and foremen, as well as the management, all assays were marked up in grams per metric ton at the points from which they were taken, these marks being made on the

mine timbers with a composition of kerosene and lamp black and corresponding exactly with the assays marked on the maps and plans kept in the drafting office. By means of these assay plans it was possible at any time to make up a very close estimate of ores in sight in the mine or any portion thereof, and in giving instructions to the mine foremen the grade of ore to be broken and portion of the mine from which it was to come, could be exactly specified.

It was a common occurrence to find a considerable variation in assays taken from the same point, this being due, not to improper sampling or assaying, but to the erratic distribution of the gold and silver in the quartz. In case there was a doubt as to whether the portion of the stope where this occurred was above or below the payable limit, the broken ore was left in the stope until the pile could be thoroughly sampled. Inasmuch as there were usually a number of these doubtful piles at various points throughout the stopes, they were designated by the position in which they lay, as regards number of the set, and when their value had been determined, were either delivered to the chutes as ore or thrown back as waste.

In breaking the ore in the stopes, drilling was done both by hand and machine, practically all work being done by contract at so much per set or cubic metre of ground broken and delivered to the chutes. The machines used were Ingersoll-Sergeant 'baby' drills and air-hammer drills, using $\frac{7}{8}$ or 1-in. steel. Hand-drilling was usually double-hand work, the steel used being $\frac{7}{8}$ in. The air-pressure carried was from 90 to 100 lb. per sq. in., and pipe lines were carried up the foot-wall raises and the air distributed to the various points of the stopes. The pipe lines in the raises were usually $1\frac{1}{2}$ or 2 in., and the distribution lines 1 in. The explosive used was 60% dynamite, fired by fuse and caps in all stope work, the fuse for comparatively dry places being 'double tape,' and where very wet 'triple tape.' The detonators or caps were in all cases quintuple strength, it being found that superior results were obtained by this method as compared with detonators of lower strength. Timber was placed by contract, either at so much per piece or per set, as the case might be, an average price for stope work being \$1 per set, which included blocking and lagging. Where it became necessary to reinforce, renew, or place extra timber or cribs, the work was handled at so much per piece.

The lighting of the stopes was done with candles, although all drifts were illuminated by electricity. The handling of the ore from the breasts to the chutes was by means of wheelbarrows or small stope cars of 16 cu. ft. capacity, where the distance was too great for economical handling by shovel, and these same wheelbarrows and cars were used in the distribution of filling material to points where it could not be delivered direct by gravity. From the chutes the ore was trammed to the shafts, both by hand and electric locomotive, the latter being used for long hauls. At the shafts the ores were either dumped into 'pockets' and from these drawn off into cars standing on the cages, after the manner of loading skips, or what was more usual, run direct-

ly onto the cages and hoisted to the surface. In loading the cages at the various stations, one deck was filled at a time, but on the surface both decks were unloaded and empty cars run on to the cages simultaneously. The first-class ore from the west veins was kept separate in the stopes and when hoisted to the surface was run direct to the sorting house preparatory to shipment to the smelter. The milling ores, both second and third class, were delivered to grizzlies from which the fine product passed directly to the large underground bins situated at both shafts, while the coarser material was crushed by means of 13 by 24-in. Blake crushers to suitable size for treatment by Huntington mills or stamps, the grizzly for the Huntingtons having an opening of $\frac{3}{4}$ in. between bars while that for the stamps had $1\frac{1}{4}$ -in. openings.

Average assays and analyses of the various ores broken, were as follows:

| | First class. | Second class. | Third class. |
|--|-----------------|------------------|-----------------|
| Dry tons sampled..... | 10,430 | 35,127 | 37,113 |
| Au grams per metric ton.... | 84.30 | 51.70 | 15.40 |
| Ag grams per metric ton.... | 875.00 | 505.00 | 97.00 |
| As % | 0.40 | ..... | ..... |
| Sb % | 0.25 | ..... | ..... |
| S % | 1.20 | 1.54 | 0.25 |
| Insoluble % | 89.00 | 84.70 | 92.80 |
| SiO ₂ % | 84.50 | 77.60 | 86.10 |
| Fe % | 2.70 | 2.30 | 1.30 |
| Mn % ..... | ..... | 0.10 | Trace |
| CaO % | 3.30 | 5.90 | 2.40 |
| MgO % | 0.20 | 0.40 | Trace |
| Al ₂ O ₃ % | 1.80 | 6.30 | 5.90 |
| CO ₂ % | 2.60 | 4.63 | 1.88 |

The tonnages given at the head of each column denote the amount of ore from which the average samples were taken, the samples being aliquot parts of smelter pulps and daily mill samples and therefore representing a correct average of the tonnage sampled. No lead, copper, fluorspar, or bismuth was found in the ore. A trace of zinc was present in the second and third class.

The timber consumption in the mine was, as might be expected from the nature of the ground, unusually heavy. The total consumption of timber as used for all purposes underground, is given in the following statement:

| | 1904. | 1905. | 1906. | 1907. |
|---|-----------|-----------|-----------|-----------|
| Total board feet consumed | 3,997,649 | 7,595,726 | 8,906,552 | 5,904,188 |
| Board feet consumed per ton ore broken | 29.70 | 39.56 | 40.27 | 35.20 |

In 1904 only the ores of the San Rafael vein were mined, while during subsequent years the west vein ores were also broken. All square sets and chute cribbings were framed by machine, the cost being as follows: girts, \$0.0687; caps, \$0.0890; cribbing, \$0.0569, each. Other timbers such as drift sets, shaft sets, raise and winze sets, were framed by hand, this being done by native contractors so much per set. It is interesting to note that in comparing hand with machine work on the framing of cribbing, the best price at which this could be done by hand was \$0.10 each as against the \$0.0569 for machine as above given.

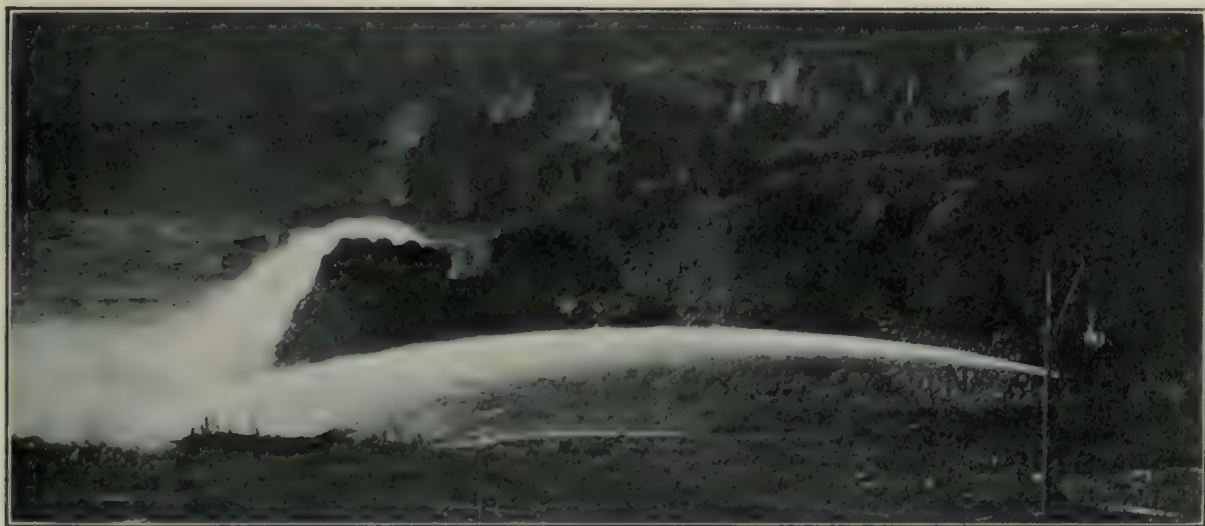
DAVIS CONSOLIDATED HYDRAULIC MINE.

The old Van Brunt mine, of approximately 1200 acres along the Klamath river in the Happy Camp basin in Siskiyou county, was recently purchased at a sheriff's sale by Reeves Davis, of San Francisco, who has re-christened it the Davis Consolidated mine. The property is interesting historically, as it is one of the oldest mines in the State, and its rejuvenation will mean much for Happy Camp. The sale included a number of buildings at the mine all in good repair, a saw mill, hydraulic equipment, with several miles of flume and a dam, which were damaged by the high water two years ago, and a number of water rights. The property, a portion of which is shown in the accompanying photograph, has been operated since 1852 under different companies, the last being the Oregon Gold Mining & Water Power Co., which was controlled by O. H. P. Belmont, and the firm of Coster, Knapp & Co. Owing to the death of Mr. Belmont

WHAT SHOULD AN ENGINEER KNOW OF LAW?

By COURTENAY DE KALB.

*A certain acquaintance with legal principles is a necessary part of a liberal education. Every man should know something of the common law, and of the civil law, which is the law of Rome. These are fundamental. Our civilization is built upon them; unconsciously we think in terms of them through the experience we acquire in the practical affairs of life, but our conceptions are crude and lead to false reasoning unless we have studied systematically. It is never safe to trust to general impressions. The common law, which is the crystallization by statutes and judicial decisions of previously established custom, deals with the primal relations between man and man. It represents the accumulated experience of the world in those adjustments of right and privilege which render possible the existence of human beings in a state of association. It is the basis of the



Part of Old Workings at Davis Consolidated Mine. Gravel Bank 170 ft. High.

and the failure of Coster, Knapp & Co., operations were suspended at the mine. November 19 it was sold to satisfy a judgment of \$80,910, the plaintiff being William De Long, of New York.

The gravel bank averages 100 ft. in height and 1800 ft. across. Only a portion has been worked. Samples taken from an adit driven 400 ft. along the bedrock, showed the gold content of that portion of the gravel to be high, and the 60-acre tract farther west has been thoroughly tested by Robert B. Stanton with a Keystone drill. It is estimated that the clean-ups of the former operators amounted to \$11,000 per acre, the mine being credited with a production of \$400,000 from 1852 to 1888, \$110,000 from 1888 to 1899, and \$200,000 from 1899 to 1906. There is ample room for disposal of the tailing as the sluices empty 85 ft. above the level of the Klamath river.

With the renewed activity in hydraulic operations at Happy Camp and the representatives of a number of companies examining copper properties in the neighborhood, the district seems to be in a fair way to again become one of the prosperous mining communities of the State.

social contract. Reduced to its simplest terms the common law establishes the bases for determination of rights and duties in regard to possession and ownership, contracts, torts or injuries, and inheritance. No man can know the law of the land in relation to any of these things by a study of the common law, for legislation is eternally changing, but certain fundamental conceptions underlie all the mass of law that has accumulated, and these conceptions cannot be arrived at by inspiration.

Advancing beyond these elements the man in charge of affairs needs a considerable amount of special knowledge. He is usually acting in a capacity which is recognized in law as that of an agent. He should know the legal limits of his authority, his duties and liabilities, his rights and privileges; he needs to know how far he can bind his principals; when he has made a binding contract for them; how he may enter into engagements which he can defend by action in court which he is capable of bringing; how far acquiescence in his acts commits his principals. The work of a mining engineer involves

*Abstract of an address delivered before the Students' Mining Association, University of California.

a multitude of complicated functions; he is perpetually entering into agreements less formal than contracts, and he needs to know the force and probable consequence of such agreements; he is called upon to make assignments, and to obtain assignments from others; he must be grounded in the law relating to damages, where the instinct to resent aggression is likely to blind his judgment. It is not easy for a layman to appreciate the significance of the principle that there is no right to damages where there is no wrong, and that an obligation violated must be one owed to the party claiming to be injured. An understanding of the principles underlying a legal basis for an action to recover damages will go far toward keeping the blood cool under vexatious circumstances. Hot-headed reprisals which seem justified by common conceptions of equity, may cause the loss of legal advantage, and work injury to a man's employers.

The control of labor soon brings the engineer face to face with problems involving conspiracy, with injunctions, and the protection of property. Newspaper law will not help a man in these affairs, and while he would appeal to a lawyer for advice if time allowed, it often happens that he must act quickly, with emphasis and accuracy. Experience is a slow and costly teacher. The man who depends upon learning how and what to do in the ordinary affairs where the law is concerned as each case presents itself, is sure to look back regretfully upon many errors. How to obtain this knowledge, is something each man must determine for himself. The crowded curriculum of a university leaves no room for a legal course of study in conjunction with technology, and a few lectures can do no more than give a little inspiration. The young man on leaving college should make good this deficiency in his training by systematic application. In the first few years of his practice he has more leisure time than he will ever have again. He is apt to think he is egregiously busy, but he really is not as busy as he thinks. There are many useful works which would serve for the elementary legal training which an engineer could obtain by private study, but I would suggest Robinson's *Elementary Law*, Pomeroy's *Municipal Law*, and Holland's *Jurisprudence*. Holmes' *Common Law* and Muirhead's *Law of Rome* might also be included. Then if one wish to go deeper he might read Kent's *Commentaries*, and finally put Bouvier's *Law Dictionary* on his shelf as a work of ready reference, along with Parson's *Laws of Business*. Another way to acquire an elementary legal training is to take a course in a Correspondence School of Law. In two years, with moderate work in the evenings, a bright student can complete a course which would suffice to admit him to the bar if he so desired. Such work makes for strength and efficiency, and can be done while a man is young without sacrifice of technical reading.

I have chosen to emphasize first the need of acquaintance with general law, because even the mining engineer will find that a hundred general problems will arise to one in which his knowledge of mining law is called into service. A great body of special law has grown around mines, and the subject

has many difficulties. The briefest treatise on the law of mines which may be accepted as standard is a recent work by George P. Costigan. Lindley's masterly compendium is out of print, but a new edition will be ready within a year. Costigan answers the questions which will concern the engineer, and the careful study of this volume will give him a firm foundation.

When a manager takes charge of a property, if he be wise his first concern will be to study the mine. There is usually something wrong there, which needs righting. After the underground situation is well in hand, and the geology of the deposit has been investigated, the rights under location of claims need to be studied. Then comes the struggle with the so-called law of the apex. Claims are usually located by men ignorant both of geology and law. Theoretically a claim should have parallel end-lines, crossing the lode, which latter should extend from end to end approximately through the middle of the claim. Then the owner may follow the lode or vein on all its dips, angles, and spurs beyond the limits of the claim, confined only between two vertical planes, containing the respective end-lines. This is the extralateral right, the most profound variation from the old common law right in real estate ever made. It has given rise to endless controversy, and often produces situations difficult to adjust by the combined wisdom of geologists and judges. In order to know what rights are controlled between the end-lines of one claim it is needful to study the position of the end-lines of adjacent claims which may have been located at an earlier date. For example, if the end-lines of claim *A* are at right angles to a straight lode, central with reference to the side-lines of the claim, and the lode dips at an angle of 45°, the sheet of ore on the dip lying within the end-planes would be traversed at no great depth by the extralateral possessory-right of a claim *B*, situated at a distance, let us say, of 600 ft. from one end of claim *A*, on the same lode, and having end-lines inclined toward claim *A* at an angle of 40°, in a horizontal plane, with the strike of the vein. When the lode is not simple as to strike and branching, the clustering of claims to take up every trifling gap in the ground which had been open for location produces complications that are bewildering. The lawyer insists that he is most competent to protect a mining property by superintending the location of claims to cover the ground, while the geologist is prone to feel the same sort of self-reliance. The fact is that it takes a great deal of experience to do it adequately, and the engineer and his attorney, working in harmony can do better than either one alone. An engineer will invariably find the property to which he is assigned as manager surrounded by a Chinese puzzle of conflicting claims. To assume that former administrations have unraveled the tangle and determined the rights on which the future of the enterprise depends is usually to repose on a couch of delusions. An array of reports, and abstracts of title, may lull the inexperienced, but one who has had a wide range of practice will never be content until he knows the history of every claim in the group, those under his control, and those be-

longing to other people. It is important to have an absolutely accurate map made of the group, showing the claims as described in the notices of locations, and as indicated on the ground by monuments, and as subsequently modified by re-location or by amended location. The geology should be plotted on the general map, and on the claim-map, and the extralateral right and its conflicts with others displayed in contrasting colors so as to be readily followed.

The proof of labor on all claims should be looked up by search of the records, and all work done on them measured or estimated, and checked against the aforesaid sworn statements, bearing in mind that an excess of work and lack of continuity in the recorded affidavits may indicate a gap which could be closed up by the testimony of competent witnesses, and that even in the absence of adequate work, visible on the claim, the testimony of witnesses may substantiate sufficient work done directly on the claim and partly or wholly obliterated, or done exteriorly to the claim but for its benefit. If there ever be any doubt as to ownership or as to validity of title it is safer to assume that possession of the claimant will be confirmed by the courts, since the courts are extremely loath to disturb a man in his possession of real property or to declare forfeiture of title.

A distinction must be drawn between title and patent. A man acquires title by certain acts of his own; by possession and use; by making discovery of valuable mineral and claiming the same in a public manner. The law prescribes the due and proper manner for locating a claim so that the right of the claimant may be indefeasible, but the common law has thrown a mantle of protection around those impeded by ignorance or other untoward circumstances, and a very feeble pretense at compliance with the letter of the statute does affect the land claimed until a court-title has been decreed, and the period for appeal to higher courts has elapsed. Even prolonged abandonment, followed by peaceful possession by others, does not remove the blot so that a title may be considered secure from attack. The safe course is to bring action against the former claimant for quieting title. Abandonment is not easy to prove, and a man's title to a mining claim endures indefinitely, though he perform no annual work upon it, until adverse possession has been made effective, and even then, if he choose to contest possession with the new locator the burden of proof of abandonment lies upon him who would assert adverse rights. Even though a claim may have lain untouched for years, the title is made impregnable by the mere entry of the locator upon it to perform work thereon. It is not a revival of title; it is making the title good against all the world. I have insisted upon these possessory rights because an impression prevails that the rights a man may acquire in real property, and particularly in Government land, are easily forfeitable. The common law idea, however, proceeds from a conception of the man as a part of the soil. The effort to dispossess a prior claimant to real estate commands the serious consideration of the courts. He is hard to shake loose, and the case against him must be so strong as to

leave no shadow of doubt. But for that the claim-jumper would be much more than the thorn he now is in the sides of those who conduct legitimate mining. Nevertheless there should be no negligence in the fulfilment of the requirements of the law to maintain valid tenure. The courts, while loath to reject the most shadowy title, are also inclined to look with superior favor upon the diligent, and diligence has been the determining point in many an important decision. Until a man has made the exhaustive study of the surrounding claims that I have indicated, he is not certain that conflicts may not occur, nor that the expansion of operations, either above or below ground, may not be the signal for kindling the fires of litigation. After such an investigation it will be apparent what need be done in purchase of troublesome or necessary claims, in compromise of rights, or in frank warfare to clear the way of obstacles for the future. Where two interests clash, and compromise fails to remove the impediment to successful operations, the best policy is to fight it out in the courts, and if a fight is inevitable the sooner undertaken the less stamp of enmity and taint of personal bitterness is it likely to leave upon the community.

It would be quite fruitless to single out points and cases in the practice of the mining law for special emphasis. The things I would light upon would not perhaps be the things you would be confronted with; and one matter is as important as another when it happens to be the irritation and threat of trouble at the moment. I will merely insist that an engineer should study the method of locating, and the effect of locating claims, in all their phases. Let me cite a few cases. A re-location is premature if attempted after a prior prospector has made a discovery and begun the acts of location, but before the time allowed him to finish the acts of location has expired. Premature re-locations have been regarded as void, but the case of *Lavagnino v. Uhlig* has thrown doubt upon that contention. Premature re-locations are those in which either a perfected location is not yet forfeitable, or where a prior locator has not yet exhausted his statutory time to perfect his uncompleted location. Another point to note is that in the absence of a survey whereby the exact size of a claim specified in the location notice can be laid out on the ground and accurately monumented, the claimant cannot obtain by patent a greater area than that included within the monuments, regardless of what the location notice may affirm. The maximum statutory size of a mining claim cannot be exceeded in any case, and if the location notice calls for less it becomes the determining guide for the Deputy Mineral Surveyor. Hence if any error be made it were better to deliberately err by setting the monuments so as to stake out more ground than claimed in the document, and then the amount so claimed will be laid out by the surveyor within the staked boundaries, and correctly re-monumented. The excess will be lopped off, and if there be no adverse contiguous or overlapping claimants whose rights might be prejudiced thereby the claimant may elect where the reduction of area may be effected; otherwise the determining feature will be the end-line nearest the

discovery and toward which the course runs for the initial bounding monument of the claim. This end-line determines as to position and length, and the opposite end-line is adjusted as to position by its course.

The location of placer claims involves other principles. The right is not necessarily superficial, but it applies to a deposit which conceivably was once superficial, and is confined within vertical bounding planes on all sides. Where the land has been surveyed the claims are to be taken in rectangular fractional parts of a land section. One individual may take any number of 20-acre claims, but \$100 worth of annual labor has to be performed on each and every claim, hence the law has opened the way to evasion (for that is what actually results in more than 90% of such cases), by providing for so-called association claims. An association of any number of persons not exceeding eight may take up one claim of as many times 20 acres as there are persons in the association, and on one such claim only \$100 worth of work is required per annum. A placer-claim can not carry title to a lode-claim; at least it leaves a loop-hole, and it becomes necessary for the defendant owner of a placer-claim as against an adverse lode-claimant to demonstrate his total ignorance of the existence of a lode on the property at the time when he made his location, and even when he applied for patent thereon. In some cases reasonable doubts arise as to whether a deposit should fall under the classification of a lode or a placer. Such an instance has arisen in regard to certain phosphate deposits in Utah. The claim was made that original lean deposits had become valuable through re-arrangement of the phosphoric acid by circulating waters, producing enriched layers. If such concentration had taken place, there would be no more reason in rejecting application for a lode-claim to such a segregated phosphate deposit than there would be for refusing patent as a lode-claim to a gold vein that represented concentration on the Sandbergian principle by lateral secretion from the enclosing country rock. The question of genesis, then, becomes a matter of great importance, to be determined by the United States Geological Survey as a fact precedent to proper classification of the land. If determined to be a placer—that is, laid down by physical agencies or by precipitation from solution in surface waters, the extralateral right would not apply. But if adjudged a lode, the deposit might be followed on the dip of the stratum for miles, and millions of tons could be indefinitely tied up by a few narrow locations on the apex, and held by the performance of the pittance of \$100 worth of work on each outcrop claim per annum. In this connection it is well to observe that in the eye of the law a lode goes down and not up. If a claim is located, for example, on an outcrop in a valley, and the lode unobliquely turns into the hill and goes upward, such a lode location will not hold it. In the meaning of the statute a lode has a point of departure, a beginning, an apex, and that apex must be found in order to constitute a valid discovery, and thenceforward, save for insignificant rolls in the vein, it must go downward into the earth.

Hence in the case of the phosphate deposits, if held under the lode-law, the right on a syncline would cease in the bottom of the trough.

In all countries but our own the old limitation to vertical bounding planes exists unchallenged. In Mexico is found a body of mining law unexcelled for fairness and protection of the rights of miners and of surface owners with whom he may be forced into association. The principles of our law will not apply in Latin countries. Proceeding from conceptions founded in the civil law, they arrive at conclusions foreign to our sense of legal fitness until that ancient code of wisdom has been made familiar to us by study and by experience of its operation. I refer to this merely to bring into relief the necessity I mentioned in the beginning for studying Roman law. Those of you who contemplate going to Mexico, Central America, Colombia, Peru, Chile, should become accustomed to viewing society and human rights as regulated by the Codex Justinianus; you must be able to actually think in terms of Roman justice, else the new world you plunge into will seem hopelessly out of joint.

The estimated life of an untreated mine-prop is approximately three years, according to W. F. Sherfeese, of the United States Forest Service. With a proper preservative treatment this life may be increased, he says, by approximately ten years, giving a total life for the treated props of 13 years. All of the mine-props, both round and square, in use in the United States, contain approximately 500,000,000 cu. ft. About 40% of this quantity, or 200,000,000 cu. ft., can be advantageously treated. If no preservative methods were used the annual replacement would amount to one-third of 200,000,000, or approximately 67,000,000 cu. ft. of timber. If they were all given a proper preservative treatment the annual replacement would be reduced to one-thirteenth of 200,000,000, or approximately 15,300,000 cu. ft. Hence, by a proper preservative treatment of all mine timbers which can be treated advantageously, an annual saving would result of approximately 51,700,000 cu. ft., equivalent to 310,200,000 ft. board measure, or more than half of the present annual cut.

Annual rentals are usually charged in the oilfields upon leased lands until a well is drilled, after which a royalty on the oil produced is paid. But when an operator in Oklahoma leases from an Indian, the Indian Office forces him to pay \$1.15 an acre a year the first two years; \$1.30 an acre a year the second two years, and \$1.75 an acre the fifth year until he drills; and if he fails to drill in five years, to lose the lease. The effect of these provisions is obvious. It forces operators to drill in spite of over-production. It prematurely tests large areas of land, and brings into development pools which would otherwise lie reserved for years. The demand of some rental for every year that a well is not drilled is an old feature of oil leases which should stand, but the automatic enlargement of this payment from year to year and the limitation of five years are wholly unnecessary and work a great disadvantage to the nation.—R. H. Johnson in *Conservation*.

PRESSURE FILTRATION.

Written for the MINING AND SCIENTIFIC PRESS
By ERNEST J. SWEETLAND.

I have recently made many experiments upon slime filtration to determine the relative rates of filtration at different pressures. The object of these tests was to study the practical side of the problem rather than the theoretical; to obtain information for application in everyday practice rather than to gather data of a highly scientific nature. For present purposes a detailed description of the filter which was used in these experiments is not called for, since like results may be obtained with any pressure-filter wherein filter-leaves or mats of any practical construction are enclosed within a cham-

walls of the leaf by applying suction within the leaf or pressure to its outer surface, filtration will progress, and the cake formed upon the surface of the leaf will be of even permeability throughout, regardless of structure or thickness; for the instant there occurs any point of decreased density, there immediately takes place an increase in the rate of filtration at that point until sufficient slime has been deposited to make the resistance offered equal to that at other points. Modern methods of filtration owe their success largely to this phenomenon, for upon the even permeability of slime-cakes depends the success of displacing dissolved metals. The following experiment offers a splendid example of this automatic distribution of slime to form cakes of uniform density: Three leaves of equal area,

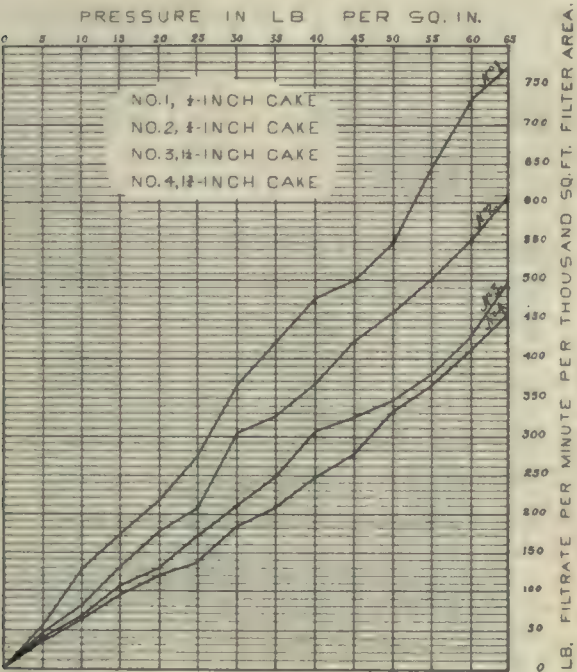


Fig. 1. Resistance to Filtration of Cakes of Different Thicknesses at Varying Pressures.

ber, and the sludge to be filtered is applied to their surface under pressure.

The results herein recorded were obtained in a Sweetland filter-press of 456 sq. ft. of filter-area, with slime which I obtained through the courtesy of the Goldfield Consolidated Mines Co. from the new Consolidated mill, this slime being selected because it was produced by modern crushing and re-grinding methods. During these tests about eight tons of slime was in circulation at the testing plant, and arrangements were made to return the slime to the agitator after each test, so that exactly the same slime could be used in each succeeding test, and thus avoid the possibility of false comparisons by a change in the character of the product under treatment.

Much has been said regarding the even permeability of slime-cakes formed upon submerged filter-leaves, the theory of which applies alike to enclosed leaves in pressure-filters, and to leaves submerged in an open tank, as in vacuum-filters. If a properly constructed leaf be submerged in a solution carrying solid matter in suspension, and a difference in pressure be created between the outer and inner

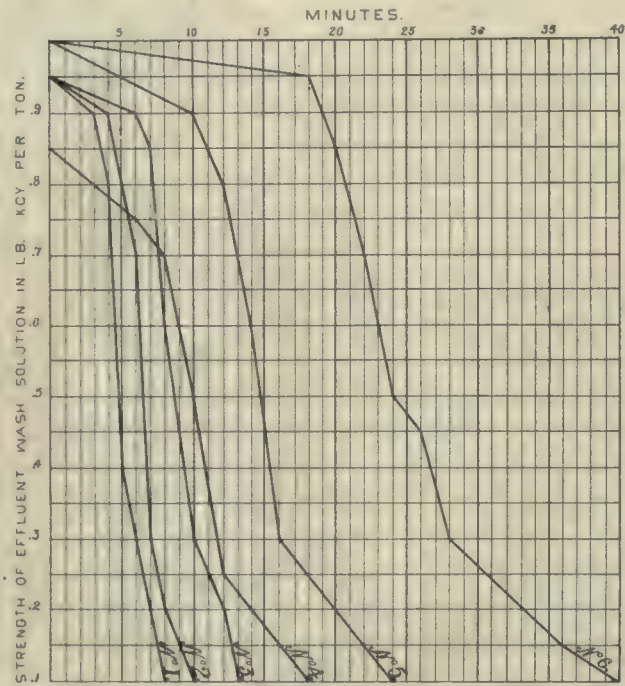


Fig. 2. Time Required for Washing Cakes at Different Pressure
No. 1, 60-lb. Pressure; No. 2, 50; No. 3, 40; No. 4, 30; No. 5, 20; No. 6, 10.

but of slightly different construction, were placed in the filter, and the filtrate from these was cut out from the general flow and conducted to three separate measuring receptacles, the remaining leaves being left intact to filter as usual. The filter-chamber was filled with sludge, and cake-forming commenced. During the progress of cake-forming three sets of measurements were simultaneously taken from the three leaves, with the following results:

| Time. | No. 1. | No. 2. | No. 3. |
|-------|--------------------------------|--------------------------------|--------------------------------|
| | Filtrate per minute. lb. | Filtrate per minute. lb. | Filtrate per minute. lb. |
| 9:55 | 21.12 | 16.70 | 21.12 |
| 10:00 | 12.10 | 12.02 | 12.52 |
| 10:10 | 9.76 | 9.76 | 9.76 |

Note that in the first measurements all flowed at different rates, and in the second the rates were more nearly equal, while in the third all flowed at exactly the same rate.

My experiments have led me to believe that the point of greatest resistance to the flow of solutions through a slime-cake is at the point of contact between the slime-cake and the filtering medium, and

that to double the thickness of a slime-cake does not double its resistance to the passage of solutions. When canvas is used as the filtering medium the pores are instantly partly clogged when filtration commences, and when the fine pores of the canvas are filled with minute particles of slime a medium is formed of greater resistance than the slime itself. Fig. 1 shows the comparative resistance of cakes of different thicknesses to the passage of solutions at pressures from 0 to 65 lb. per square inch. It will be noticed that the rate of flow is not in inverse proportion to the thickness of the cake. Note, for example, that No. 4 flowed 58% as fast as No. 1, while the cake was $3\frac{1}{2}$ times as thick. In plotting this chart, cakes were formed of the thickness indicated, and clear water was forced through them, first at 5-lb. pressure, then at 10, 15, 20, and so on, a measurement of the rate of flow being recorded after each rise in pressure.

In the preceding experiments no cyanide was used in the solution, the purpose being to study the problem from a physical rather than from a metal-

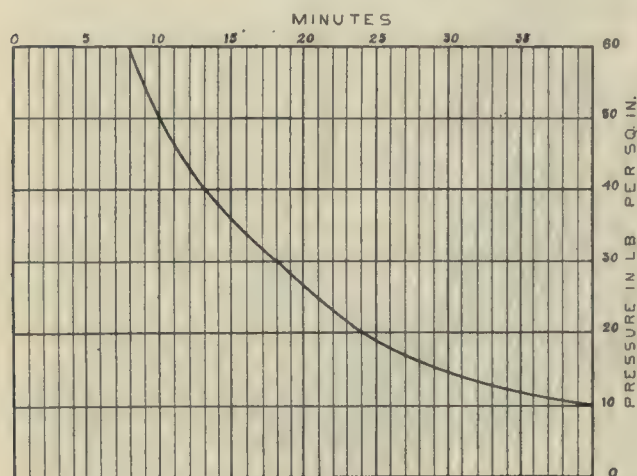


Fig. 3. Time Required for Displacement at Pressures Varying From 10 to 60 lb. per Square Inch.

lurgical standpoint. The next series of experiments was for the purpose of determining the time required to displace with wash-water the cyanide solution contained in slime-cakes. Cyanide was added to the pulp to bring the solution up to 1 lb. KCy per ton, and fresh wash-water was used to wash the cakes. The results are shown in Fig. 2, where the curves representing the progress of displacement were plotted from titrations of the effluent wash-solution. Effluent solution-samples were taken at intervals of one minute and carefully titrated later. In each case the cakes had been formed for the same length of time (20 minutes) and were about $\frac{7}{8}$ in. thick. All other conditions governing the tests were held as nearly alike as possible, the varying factor being the pressure of displacement. In this series it was assumed that displacement was practically complete when the cyanide strength dropped to 0.1 lb. KCy per ton, or 0.005%. It was found that the cakes were washed with equal thoroughness at all pressures, and the amount of wash-water required was the same in each case, regardless of pressure. The benefit of pressure in filtration is therefore not to increase the efficiency of the water

or barren solution-wash, but to decrease the time required to accomplish it.

The great saving in time effected by washing under reasonably high pressure is apparent. To wash a slime-cake thoroughly requires a certain fixed amount of wash-solution, and the time required to pass this amount of solution through the cake depends entirely upon the pressure at which it is applied. The time required for forming the cakes also depends upon the pressure at which the sludge is applied to the filter-surface; therefore the capacity of a filter leaf in pounds of dry slime per square foot per day depends upon the pressure under which it is operated. The length of time required to wash a cake of this slime $\frac{7}{8}$ in. thick is represented by the curve in Fig. 3, which was plotted from the results shown in Fig. 2. In the test recorded in Fig. 2, it was assumed that when the strength of effluent solution dropped to 0.1 lb. KCy per ton, the cake was sufficiently washed for practical purposes. Another displacement test was made to show the comparative length of time required to completely

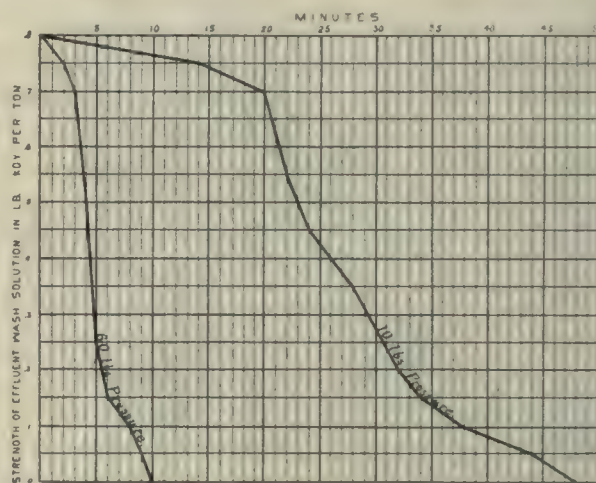


Fig. 4. Comparison Between Displacement Curves at 10 and 60-lb. Pressure.

displace the solution in the cake. The curves representing the progress of complete displacement are shown in Fig 4, where a test at 10-lb. pressure and one at 60-lb. pressure are recorded for comparison. The comparison is the more interesting because 10-lb. pressure is about the pressure equivalent of a 20-in. vacuum.

It is interesting to note that the rate of flow of filtrate while washing at 60-lb. pressure was 20 gal. per minute, and at 10-lb. pressure it was 4.16 gal. per minute. At 60 lb. it required 10 minutes for complete displacement, and at 10-lb. pressure it required 48 minutes; therefore the amount of water required was 10 by 20, or 200 gal. in the first case; and 48 by 4.16, or 199.68 gal. in the second case.

The curves show that the last traces of cyanide solution are more slowly displaced than the bulk of solution, which is due to osmotic action between the wash-water and solution. At 10-lb. pressure it required 10 minutes to reduce the effluent wash-solution from 0.1 lb. KCy per ton to zero, which was the total length of time required for complete displacement at 60-lb. pressure. The results of the experiments here recorded, as well as several hun-

dred others I have made, justify me in the conclusion that economy in filtration lies in the use of comparatively small filter-leaves operated under pressure, rather than in large ones with vacuum. The capacity of a filter-leaf is dependent entirely upon the pressure at which it is operated. It seems a useless extravagance to use leaves in such a manner that only one-fourth or one-fifth of their real capacity is developed, and that is what is now being done with vacuum leaf-filters.

Take for instance any sort of vacuum filter-leaf and submerge it in a tank of sludge and operate it as a vacuum-filter. It will take probably three hours to form, wash, and discharge a cake 1 in. thick. Then take the same leaf and put it in an enclosed tank and operate it as a pressure-leaf, using, say, 60-lb. pressure, and exactly the same metallurgical results are obtained, but the time consumed is only about 45 minutes. Furthermore, the use of leaves under pressure will make for higher metallurgical efficiency, because when displacement can be rapidly performed, the washing of slime-cakes will not be slighted for want of time.

Successful use of filter-leaves under pressure is simply a matter of the mechanical design of the chamber containing them. Filter-leaves can be operated under pressure with the same degree of convenience with which they are operated with vacuum, and with a great saving in first cost and in maintenance.

Considering that if it were possible to provide a cover for an ordinary vacuum-filter installation, and operate it under 60 or 70-lb. pressure, its capacity would be multiplied 4 or 5 times, one cannot fail to be impressed by the possibilities.

SODIUM SULPHATE IN SAN LUIS OBISPO COUNTY, CALIFORNIA.

By RALPH ARNOLD and H. R. JOHNSON.

*Deposits of sodium sulphate are found in the lowest portion of the Carriso plain, which extends along and within the northeast boundary of San Luis Obispo county, Cal. The lake known locally as Soda or Salt Lake, in the bed of which this salt occurs, lies wholly within T. 31 S., R. 19 E., and T. 31 S., R. 20 E., and is about 12 to 15 miles west-southwest of McKittrick, Kern county, the nearest railroad station. It receives the drainage from the Carriso plain and the adjoining flanks of the bounding ranges, the total catchment basin including somewhat over 525 sq. mi. The lake has a length of about 5 miles and a maximum width of a little over a mile, and includes an area of nearly 3000 acres. It remains practically dry except in extraordinarily wet seasons. The region in which the deposits occur is of the arid type characteristic of the intermontane valleys of California away from the coast. The Carriso plain has a length of about 40 miles and an average width of 12 or 15 miles and extends parallel to the enclosing mountains—the Caliente range on the southwest and the Temblor range on the northeast. The lowest

point in the plain lies at an elevation of about 1925 ft. above sea-level.

The plain itself is a structural depression which has been faulted down between the Caliente and Temblor ranges and has been sufficiently covered by Pleistocene and possibly earlier debris to mask its real character. Faults, some of them very recent geologically, bound the plain along its northeast and southwest margins. The amount of folding and faulting which has taken place in this region is very great. This intense deformation has, in conjunction with denudation, exposed large areas of soft conglomerate, sandstone, and shale, particularly in the adjacent ranges, to the solvent action of rain, and thus through the agency of running water the soluble salts of these rocks have been transferred, in part, to the lowest portion of the plain. There they have been deposited, through evaporation of the solvent, in a series of saline beds, the chief constituent of which is sodium sulphate. A sample of this salt collected at the surface of the lake, just west of the present evaporation plant, which is in Sec. 19, T. 31 S., R. 20 E., varies from dull to lustrous pure white in color and, though more or less granular, may be easily crushed between the fingers. An analysis of the salt, made by George Steiger in the laboratory of the United States Geological Survey, is as follows:

| | Per cent. |
|--------------------------------------|-----------|
| Insoluble | 0.40 |
| Al ₂ O ₃ | 0.04 |
| MgO | 1.66 |
| CaO | 0.45 |
| Na ₂ O | 40.50 |
| K ₂ O | 0.28 |
| H ₂ O— } | 3.65 |
| H ₂ O+) | |
| CO ₂ | None |
| SO ₃ | 46.12 |
| Cl | 9.27 |
| | 102.37 |
| Less oxygen | 2.09 |
| | 100.28 |

The two analyses below were made by Thomas Price & Son, of San Francisco, the first in October 1904, and the second in November 1905.

| ANALYSIS OF SODIUM SULPHATE CRYSTALS FROM SODA LAKE. | |
|--|-----------|
| | Per cent. |
| Anhydrous sodium sulphate..... | 42.78 |
| Sodium chloride | 0.32 |
| Water | 56.90 |
| | 100.00 |

| ANALYSIS OF DRIED SAMPLE CRUST FROM TOP OF SODA LAKE. | |
|---|-----------|
| | Per cent. |
| Insoluble matter | 0.16 |
| Sodium sulphate | 98.65 |
| Sodium chloride | 0.47 |
| Magnesium sulphate | 0.43 |
| Loss and undetermined..... | 0.29 |
| | 100.00 |

It is stated that tests indicate that the surficial deposit of this salt is from 1 to 6 ft. in depth and is underlaid by a supersaturated solution of the sulphate and water. The deposit offers an almost unlimited supply of mixed salts and its profitable exploitation is dependent almost entirely on transportation facilities, which at present are inadequate.

*Abstract from 'Contributions to Economic Geology, 1908', U. S. Geol. Surv., Bull. 380.

ARE WE PROGRESSING?

Written for the MINING AND SCIENTIFIC PRESS
By S. A. WORCESTER.

While Americans quite generally believe that the majority of modern inventions of most far-reaching importance and of the greatest benefit to mankind have originated in the United States, it is undeniable that the managers of many important and relatively permanent enterprises are slow in the adoption of many of the best known devices for saving labor, fuel, and power, the principal items of expense in mining. When installing new plants, managers often place in use wasteful devices rather than pay a little more for modern apparatus even though the cost would be repaid in a few months. In the lines, for instance, of balanced electric hoisting, and the adoption of the gas-engine, using producer gas and blast-furnace gas, the Germans, Belgians, French, and Swiss have been more progressive than Americans. One remarkably cheap, simple, and satisfactory arrangement, the Koepe hoisting or winding system, which has been used by the Germans for many years, and which is admirably adapted for balanced hoisting at the majority of American coal and many of the metal mines, is, so far as I am informed, unused in the United States. The State of Colorado, with its many millions of annual mine output has but one balanced tail-rope hoisting plant in operation, that of the Liberty Bell mine, at Telluride. Nevertheless, the advantages of tail-rope hoisting are clearly stated in almost every text-book which touches the subject. The complete elimination of dead weight which the balanced tail-rope system effects, saves in many cases much more than 50% of the power cost. It also reduces greatly the size of motor or engine required for hoisting a given load. One of the important advantages of the Koepe sheave hoist over the drum-hoist is that in case of over-winding the rope will slip on the sheave before any great damage is done. Although the Koepe hoist, as used in Europe, is direct-acting, with large and expensive motors or engines, there is no important objection to the use of gears, for hoists of moderate capacity, with much smaller motors. In this form the hoist is about the least expensive plant imaginable. Ropes last much longer with this than with any other form of hoist and friction is probably less than with any other arrangement.

Although the counter-balanced or over-balanced single-compartment hoist has been frequently described in the technical press for a number of years, unbalanced hoists are still commonly being installed for handling considerable tonnages. It is not at all unusual for such a hoist to be wasting more power in hoisting useless dead weight than in useful work hoisting ore; with a correspondingly large coal or power bill. It is a matter for congratulation that the skip is being generally adopted in preference to the cage for hoisting ore. In the Cripple Creek district there was, in 1904, but one skip hoisting plant in operation, whereas there are now ten such hoists in use and a number projected. The total number of hoisting plants in the district is probably less now than at that time.

One of the larger items of expense which should attract the attention of managers is that of hand tramming. Where immense waste dumps of thousands and sometimes millions of tons are made by large numbers of men pushing cars which carry from 1600 to 2000 lb. for long distances, the aggregate expense of tramming, and of maintaining trestles and track, is enormous. To reduce this expense I have designed a side-dump motor-car which is used at two of the mines of the Cripple Creek district. It is operated by the engineer by means of a controller placed conveniently near the hoist. One serious defect in the practice of making dumps with the tram-car is its failure to utilize all available dump-room. One of the mines of this district, having exhausted its dump-room on the hillside below the shaft, has built up an immense dump on the upper hillside, by hauling a self-dumping car up a grade of about 30°. An electric hoist placed at the foot of the dump is used for this purpose. Some mines use side-dumping motor cars operated by a motorman for hauling waste to the dump. These cars are much larger than the hand-trammed car and necessitate heavy and expensive trestles. Many practical methods of eliminating this expense have been described and illustrated in the technical press, in recent years, and a little attention to this detail would result in a large saving of labor and material.

In the line of steam-plant economy, comparatively few operators seem to appreciate to any adequate extent the value of high steam pressures, the expensive use of steam, high temperature of feed-water, careful utilization of waste heat and other well known essentials to steam-plant economy. Not infrequently a mine is found having an extensive steam-plant with a fuel bill of several thousand dollars per month, under the supervision of a well paid master mechanic, yet ignoring some of the commonest and simplest apparatus for saving steam and fuel. In some cases this is the fault of penurious and short-sighted managers. In others of employing poor mechanical talent.

One of the most aggravated and prevalent forms of labor-waste now known consists of the unnecessary use of the shovel in mining and reduction plants. It is used for firing boilers in many cases where mechanical stokers would pay handsomely. It is used for loading mine dumps into tram-cars for re-treatment in mills in cases where a cableway and grab-bucket or a scraper-bucket excavator would save 75% of the total cost of handling the material. The shovel is used in a number of cyanide plants of which I know, for discharging leaching tanks, for leveling charges, and for various operations which should by all means be performed by automatic machines which are now well known. Bins having bottoms too flat and receiving their contents from spouts placed too low, so that they cannot be completely emptied nor can they be filled to capacity without much shoveling, constitute one of the most common forms of labor-wasting devices.

In smelting operations some of the large concerns still employ small armies of unskilled laborers using the shovel, and an equally antiquated device, the wheelbarrow, to transport about one-fourth of the

load that can be handled conveniently with the ordinary mine car. This makes frightful labor costs. Many operators and managers, if I may judge from their practice, carry the general impression that all such apparatus as elevator and conveyor systems, aerial tramways, cableways, grab-buckets, scraper excavators, and other automatic devices of any considerable magnitude, for handling materials, are necessarily cumbersome and expensive, and not to be considered seriously except in connection with complete new plants of large size. The fact is that many such devices are available in the simplest forms and in some cases cost less than the present back-number arrangements. Better results may be easily gained if managers will pay more attention to the possibilities in the use of up-to-date apparatus, and will take advantage of every opportunity to observe the latest practice at the best plants as now in operation in different mining districts. Many operators can improve their knowledge of their business immensely by reading closely the technical press. This constitutes an up-to-date source of information on these subjects which no well informed man can afford to neglect. While it cannot be denied that as a nation we are progressing in the adoption of modern inventions, it must also be admitted that we have still many conservatives who greatly retard the wheels of progress. While each of these obstructionists has an ever ready argument with which to defend his plant against criticism, the argument does not check the waste. In the race of progress it may well be questioned whether we are maintaining a safe lead over all other nations.

KATANGA COPPER BELT.

By F. E. STURT.

*The Katanga copper region lies north of the Congo-Zambesi divide, in the southern portion of the Katanga district of the Belgian Congo, and from 400 to 450 miles north of the Zambesi river. The main portion of the belt is 250 miles long, and varies in width from 30 to 60 miles. It extends 90 miles westward of the Kambove mine, and 160 miles southeast of it. The Star of the Congo mine, which will be the first producing centre of the belt, is some 100 miles southeast of the Kambove. The country lies at an altitude of from 3500 to 5000 ft. above sea-level, with a somewhat rolling contour, and covered with patches of thin forest. The climate is sub-tropical and very healthy. Water is found in abundance, the annual rainfall, which continues over the six months from November to April, ranging from 50 to 60 in. Altogether about 160 distinct copper deposits, many of them small, but many, also, of large extent, have been discovered on the Katanga belt. Upon nearly all these deposits are found ancient superficial workings, indicating generally a more or less organized exploitation upon a scale of considerable magnitude. Only some 15 of the occurrences have been explored up to the present.

The general geological features show a remarkable parallelism with those of the rest of South Africa, so that all the leading systems of the lower end of the

continent as distinguished in the Transvaal and Cape Colony, for instance, together with their principal characteristics, are represented by corresponding strata in the Congo area. In southern Rhodesia, south of the Zambesi and the Rhodesian territory to the north of the river, a similar succession of formations with similar features to those of the more southern British territories have been noted, and these may be correlated with those of Katanga. The rocks of the Transvaal system cover a large portion of the Katanga country, and practically all the mines of the copper belt, as well as those of the Bwana M'Kubwa district, in northwestern Rhodesia, and others on the extension of the copper belt to the southeast occur in the dolomitic series of rocks which are a part of this system. The Ruwe gold and platinum deposit at the western end of the copper belt, as well as the lead-zinc mine of Rhodesia Broken Hill, and the deposits of the Kafue copper belt, in northwestern Rhodesia, are also situated in this group of rocks. The basal rocks of the system form the Wemashi series of conglomerates and pudding-stones. They are more or less conformably overlaid by the Kambove series of dolomites and shaly dolomitic sandstones, which are generally pyritic.

Along the copper belt there exists evidence of a great deal of local disturbance, as shown by folding and contortion, faulting and crushing of the rocks. The cupriferous deposits are nearly always associated with these disturbed beds. The occurrence of a finely comminuted and very much slickensided crushed rock of a talcose or clayey composition is common in connection with many of these disturbances, together with well developed bodies of breccia. A quite general occurrence is noted, also, of a cellular quartzose rock, always developed parallel with the stratification, and evidently derived from the silicious dolomites as is indicated by the rhombohedral cavities contained in it. The cavities are often infiltrated with secondary quartz, and are frequently, also, more or less filled by malachite and asbolane. It is worthy of note that in some of the folded copper-bearing beds, where the different limbs of the fold may be observed close together, one limb is cupriferous and the other barren of copper. In the southeastern extremity of the Katanga field many of the deposits are closely associated with granite rocks. The chief minerals in the superficial portion of the copper deposits are malachite and chrysocolla, although other ores and native copper occur as well. They are usually found as impregnations of the sandstones, or as finely laminated layers in the more shaly rocks, or in the shape of crystallizations filling the cavities in the altered dolomitic rocks. Occasionally they exist as disseminated grains in the sandstones and dolomites, and sometimes are seen as pyritic veins, together with vein quartz. Often, too, there are fine examples of the secondary deposition of cuprite which alters through melaconite to malachite. The axis of the mineralization is always along the strike of the rocks, and the outline of the deposits is generally lenticular, the cupriferous sections merging into the barren unaltered rocks. The ores are always accompanied by gold and silver in small amounts.

*Abstract from *The South African Mining Journal*, October 23, 1909.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy. The Editor welcomes the expression of views contrary to his own, believing that careful criticism is more valuable than casual compliment. Insertion of any contribution is determined by its probable interest to the readers of this journal.

American Merchant Marine.

The Editor:

Sir—In considering the question of national ship subsidy legislation, the fundamental conditions that must necessarily underlie the existence of a mercantile marine, if it is to be maintained in a healthy and normal state, are sometimes forgotten, or disregarded. It is often assumed that, because prior to 1830-40 we possessed, as a nation, the finest commercial shipping list of the day, we ought to have it now, and that it is something of a national disgrace or mortification for the American flag to be so rarely seen in the great ports of the world, and its decline is generally ascribed to the restrictive features of the Morrill tariff and those that have succeeded it. It seems not to be remembered that in the first half century of our national existence our country consisted almost entirely of a narrow belt of settlements along the Atlantic and Gulf coasts, whose merchants and business men were entirely dependent upon the sea for trade. In those days there were no railroads to the interior, and, in fact, no settled interior of any kind. Our surplus production was small and of the crudest kind, as is the case with all new lands. Without rapid transit facilities, settlement extension progressed slowly. Most of the citizens of the Republic looked seaward for their activities. The fisheries grew large and important. Coast and river-borne trade were active, and canal construction was undertaken to aid it. These employments naturally produced a class of laborers looking to the water for a livelihood, and a class of capitalists willing and anxious to invest their money in vessels. Those of the ocean class, finding insufficient employment at home, sought cargoes in all parts of the world. In those days there were fine profits in maritime adventure, and American ships were everywhere in the van.

With the commencement of railroad building from the coast, inland, the whole aspect of affairs was changed. The gaze of the people turned from seaward to landward. A magnificent interior, rich in agricultural possibilities, forests and minerals was found. The working class, believing it could improve its condition by occupying it, and encouraged by favorable laws toward that end, abandoned the sea by the thousands, and emigrated into the Mississippi Valley. Simultaneously capitalists found use for their surplus money in the construction of railroads, fully as profitable, if not more so, than in building and operating ships, and free from some of the perils incident to water traffic. At the same time, also, the profits of ocean commerce began to decline markedly, by reason of the vigorous entrance into the business by other nations, notably England; and European capital, harrassed by the political uncertainties of that part of the world, embarked eagerly in the occupation. Hence American shipping naturally de-

clined, and the immense sea-carrying trade of our country passed into the hands, mainly, of Great Britain, a land with but an insignificant interior area, to whose people the ocean always has been, and always will be, a natural field of adventure.

Since the days of this change Americans have been devoting their energy almost entirely to the opening and development of the magnificent continent they have fallen heir to, and now that the Pacific coast has been reached, and the vast stretches between it and the Atlantic fairly occupied, instead of turning to the sea again, our surplus population and capital is pouring across our northern and southern boundaries into Canada and Mexico. This is almost certain to continue until the Arctic has been reached at one extreme, and the Tropics at the other, and more than likely the latter will be crossed, and American influence and energy continue its march over the land, until the southern ocean and the Antarctic bar further progress. Why not? Why should the normal American take to the water, with its limited scope of activity (fisheries and transportation only) when an unlimited number of other opportunities, equally attractive and far safer commercially, are calling him on the land. With great openings yet available to the working man for homes and occupation in agriculture, forestry, and mining, and to capitalists in transportation, manufacture, mine development, and the improvement and usage of the enormous sources of power on every hand, with a government not only permitting but encouraging individualism, and so producing a generation strongly inclined toward inventiveness and the exploitation of new ideas, with environment fostering peace throughout an entire continent, it will be at least a hundred years before Americans will be inclined to turn their attention again to the oceans of the globe. In the meantime, let those nations, conditioned as are England and Japan, employ, use, and command the sea. It is their natural field; they can have no other. They can use it infinitely better than we. To attempt competition with them in their normal branch of activity would be as futile as for them to use their diminutive land areas in contesting with us the primacy in the production of food stuffs. As deeper thought is given to the subject, it becomes clear that the only reason why protection, as a commercial principle, has been so enormously successful in the United States, is because our country is fitted by nature to produce and manufacture almost everything that the human mind can desire or think of. In other lands, differently conditioned, it yields different results. But there are some activities that even we, if we are entirely wise, will leave to other nations, for the present at least, and among them is sea transportation. It is not our proper vocation at this time.

Among thinking Americans the belief is strong that the recurrent agitation for ship subsidies is fomented mainly by a few who have become during recent years interested financially in an occupation that has proved to be only moderately profitable, because inherently not a natural and normal one; that their aim is, by securing subsidies at the expense of the whole people, to enhance the value of their

investment; that if subsidies were secured, they would not build more ships, or carry the flag into more ocean ports, but instead, would simply close-out their holdings gradually to foreign transportation companies, leaving them to enjoy the benefits of the tax, as long as it was maintained. Will the American people assist in completing such a program? In deciding the question, let the following points be well considered: First, that sea-borne trade at the present time, is an occupation yielding but small profits upon the investment; 3% is a maximum, unless Asiatic labor is employed. Second, that it is not the normal field of activity, at present, for the American. His hands are more than full in other and more necessary and more profitable work. Third, that a nation possessing a great mercantile marine, must, of necessity, possess a great navy to protect it, thus calling for additional insurance on a venture of doubtful advisability.

America has been, for many years, the greatest producer of food-stuffs, and of a number of necessary raw materials, such as cotton, coal, iron, and copper, and is now the second in the matter of manufactures. Year by year we are advancing faster in these respects, as well as in the development and utilization of our power resources, than any other people have in the past, simply because we happen to control the largest body of undeveloped and unexhausted land in the temperate zone. The rest of the world must have our exportable surplus. It would go hungry and shivering and comfortless without it. Let the world come and take it, f. o. b. the seaboard. Let them also build their own navies to protect their own ships. Why should we undertake the delivery of our goods, when the merchants of the globe are crowding to our counters, paying spot cash for everything, and asking only the privilege of carrying their purchases away themselves.

THEO. F. VAN WAGENEN.

Zacatecas, Mexico, November 5.

[We are glad to print the above communication from Mr. Van Wagenen. It brings out a number of points which are worthy of consideration. The facts are largely as he puts them, but the argument was truer 20 years ago than it is today. America is confronted by a keen 'land-hunger', which means not only that the best public land available for agriculture has been taken up, but that agricultural production has not kept pace with the demand for food-stuffs created by the congestion of population in cities and the diversion of laborers to manufacturing and mining. The manufactures of this country are increasing at such a rate that in order to maintain them an outward pressure for markets is becoming increasingly strong. Thus the American is again casting eager eyes over the seas, looking for markets. So far as relations with the greater powers are concerned, there is now some competition with them on their own ground. To be sure, the American pays for this by submitting to higher prices behind his tariff wall, in order to offer his surplus at lower prices abroad. That is another matter. The interest of the mining world in a growing merchant marine lies in the certainty of its producing closer re-

lations with other countries, leading to the development of industries in foreign lands by Americans who will perforce elect to utilize American manufactures, and as we have repeatedly pointed out it will ultimately lead to our control of the metal markets of the world.—EDITOR].

Researches upon Cripple Creek Telluride Ore.

The Editor:

Sir—Kindly give publicity to this letter in reply to Henry B. Haigh's article in your issue of November 20.

John Collins Clancy was never chief chemist of the Portland mill. He worked in our laboratory a few months at day's pay. J. M. Tippet was and is the only chief chemist we ever had and Thos. B. Crowe was his assistant before his promotion. The use of cyanogen iodide in connection with potassium cyanide as a solvent for telluride of gold and the manner of producing it in contact with the ore, was the invention of Mr. Crowe and Mr. Tippet and was never claimed by Mr. Clancy until after he left the service of the Portland company. Our laboratory notes from day to day show this, and Mr. Clancy was not even in the State of Colorado when the experiments were made, as shown by the company's records. The process was abandoned by the Portland company over a year ago on account of the high cost of the chemicals used. The Portland company is not now using in its new mill or any of its old mills any process Mr. Clancy ever used during the short time he was with the Portland company; or any chemical ever suggested by him to us, or any process or chemical that could be construed as relating to any patent or suggestion of his, even in the most remote manner.

THE PORTLAND GOLD MINING CO.,

By FRANK G. PECK, President.

Colorado Springs, Colorado, December 2.

Gold in copper bullion may be accurately determined as follows: Dissolving the Cu in conc. H_2SO_4 affords some Cu_2S in the residue. If, however, some $CuSO_4$ is used with the acid but little sulphide is formed. Hence treat one assay ton of the borings with a mixture of 80 c.c. conc. H_2SO_4 and 25 c.c. of a 16% $CuSO_4$ solution. When action stops, cool, stir in 400 c.c. water, bring just to a boil, and filter. Dry and ignite the filter, and then scorify with 35 gm. Pb and 1 gm. SiO_2 . Cupel and part. If Ag is to be determined, oxidize the filtrate with $KMnO_4$, add 1 c.c. of saturated solution of NaCl, then 10 c.c. of 10% $Pb(C_2H_3O_2)_2$, let stand over night, filter, and add the precipitate to that containing the Au, before scorifying.

Stibine, SbH_3 , according to nearly all of the textbooks, when passed into dilute $AgNO_3$ affords Ag_3Sb as a precipitate. Reckleben believes this to be true, but that almost immediately a reaction occurs between the Ag_3Sb and excess of $AgNO_3$ which affords Ag and H_3SbO_3 , the latter in quite insoluble form, so that but little Sb, though always a perceptible amount, re-enters into solution. The reaction, therefore, is essentially parallel to that with AsH_3 .

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

Grams per metric ton may be converted into Troy ounces per ton of 2000 lb., by multiplying the number of grams by 0.02922.

Reheating compressed air under favorable conditions will increase the efficiency about 20%. This is done at a comparatively insignificant outlay for fuel.

Colombia annually exports to the United States over \$500,000 worth of gold, much of it in the form of gold-dust. The platinum exports are small, and are exceeded by emeralds, the shipments of which have a value of about \$40,000 per annum. Other minerals exported amount, in value, to about \$60,000. Small exports of asphaltum are also made, worth about \$10,000 a year.

Extraction of gold will usually vary with the original assay value of the ore when treating material of similar character from the same mine. This is conditioned, apparently, upon the fineness of crushing the ore, since changing the mesh of the battery screens, or making other adjustments to alter the grade of comminution, will shift the point below which no further extraction can be effected.

Coagulation of slime in gold ore by means of lime has sometimes been observed to reduce the percentage of extraction, and also to reduce the recovery of concentrate. Coagulation by acidulation is said not to produce such a result. The lessening of extraction with certain ores by coagulation is due to locking up of suspended particles of sulphides or of extremely fine gold in the flocculent masses of slime.

Slags used in smelting lead ores are usually monosilicates, the bi-silicates not being suitable as they carry away too much lead as a silicate. They are also more viscous, and cause irregularities in the working of the furnace. The mono-silicate, however, requires more base for fluxing the silica and is, therefore, not always economical, and other slags are aimed at, having oxygen ratios of 2 to 3, 4 to 5, and so forth. The type formula of the mono-silicate is $2RO \cdot SiO_2$.

Wolframite and hübnerite are closely similar minerals, the former containing iron, while the latter is merely a tungstate of manganese. The two are usually associated. The occurrence of hübnerite which was first described was at the Erie and Enterprise veins in the Mammoth district, Nevada, in argillite, that is, slate of a dense fine texture, where it also was associated with scheelite (tungstate of lime), fluor spar, and apatite. These minerals, however, generally occur in granites, gneisses, and similar rocks, and in almost all tin deposits.

Foundations for structures on loose gravel may often be made sufficiently strong by driving pipes, 2 to 3 in. diam., the pipes being perforated. After driving to the required distance the pipe should be

cleaned out, which can be done with an ordinary sand-pump, such as used by well-drillers, and thin grout, then forced in under head sufficient to cause it to penetrate the surrounding gravel. The pressure required will vary from 60 to 120 lb. per sq. in., the higher pressure being required when considerable sand and argillaceous matter are present.

Flowage of rocks without fusion occurs under simple pressure by a process of granulation, or changing of position of the grains of which it is composed. This may take place without fracture, that is, without the opening of cracks, the whole mass moving like a plastic body. According to C. R. Van Hise the maximum possible depth of the zone of fracture for the strongest rocks under quiescent conditions is not greater than 10,000 to 12,000 metres, and for the majority of rocks the zone of flowage is reached at much shallower depths. The openings of the zone of flowage are chiefly subcapillary.

Superheated steam losses are greater at high velocity of flow through the delivery pipe than at low velocity. The temperature-fall from the centre to the circumference of the pipe is less, and therefore the temperature of the pipe is higher, the temperature-difference between it and the air greater and so the loss is greater; while at low velocity these effects are reversed. The steam has longer time in which to cool, but the fall in temperature across the cross-section of the steam-column is greater, and hence the temperature of the pipe, the temperature-difference between the steam and the air, are less, effecting a lower absolute loss.

Hydrogen peroxide, or hydrogen dioxide (H_2O_2), useful as a sub-cutaneous injection in cases of cyanide poisoning, is formed when barium dioxide is treated with hydro-chloric acid or with dilute sulphuric acid, according to the following reactions:



In the latter case the barium sulphate formed being insoluble the solution may be clarified by filtration. Distillation of the liquid in a vacuum, repeated several times, results in concentration of the peroxide, which when pure, boils at 84 to 85°C. at normal pressures. It is an unstable compound, and deteriorates on keeping.

Cinder concrete is untrustworthy as regards strength, but sometimes is used in a 1-2-4 mixture with a compressive fibre-stress of 200 lb. per square inch, thus classing it with burnt clay, but it is not good practice, and so cannot be recommended. The cinders should be carefully selected and freed from ashes. In the majority of cities cinder concrete is not allowed to be used in spans exceeding 4 to 6 ft. When greater spans are permitted they are never more than 10 ft., and must be designed after testing a sample slab or beam to destruction, using the data thus obtained with a factor of safety of 10. The ultimate strength of good, well made cinder-concrete is about 900 lb. per square inch in compression at the end of 30 days with a 1-2-4 mixture.

Special Correspondence.

MEXICO.

Pachuca.—New Locations.—Santa Gertrudis. — Santa Barbara, Chihuahua.—Batopilas Re-Organization. — Casas Grandes Smelter. —Palmilla.—Douglas Copper, Sonora.

The Argentina y Anexas mines, a group in the Chico district to the north of Pachuca, have been sold to Howard T. Oliver. It is stated that heavy investments will be made, and the mines will be developed and worked on modern lines. These properties are well known and have been large producers, but have not been worked to any extent for some time past owing to lack of capital. The fraudulent use of a name for the promotion of a mining company, that is similar in the name to some famous and well known mine, is an old trick. A hole in the ground in the Taxco camp was recently passed off as a mine, and a company floated in the United States under the title of the Dos Estrellas Mines & Development Co. Fortunately the scheme has been



Street Scene in Pachuca.

squashed by the United States postal authorities as being an improper use of the mails.

A company is to be promoted in the United States to develop a group of promising prospects and mines in the Zacualpán district. The most important of these are the Genoveva, the Santa Ines, and the Concepción. Alfredo Chabaund, the general manager of the Cuchara mines at Zacualpán, is the moving spirit in the enterprise. Referring to the work in progress at the Seguranza Mining Co.'s properties at Zacualpán, everything is now about ready to start the mill. The mine has been unwatered, ore is being taken out, and connections have been opened between the Zaragoza and Coronas levels. Some good milling ore has also been developed in the workings of the Ampliación de Olivado, a claim that was recently purchased. The electric sinking pumps and air-drills, lately acquired, are being transported to the mine. The 100-ton mill that has been erected, is now completed, and the only delay is due to the time required for the completion of the power-line between Sultepec and Zacualpán. It is expected that the whole plant will be in running order by the beginning of the year.

The cyanide plant of the Santa Gertrudis y Guadalupe company at Pachuca is nearing completion and it is expected that at least part of the plant will be ready by the middle of January. Messrs. White and Newcomb deserve credit for the speedy way in which they have handled this job. The unwatering of the Angustias, Dolores y Anexas

group is steadily progressing. At level 10 good ore-shoots have been found from 40 to 95 metres long. About 200 tons of ore per week is being taken out, averaging about 400 grams silver and 11 gm. gold per ton. It is expected that the cyanide plant will be put into commission about the end of December. The richer ore is being shipped to the Aguascalientes smelter. A group of some 50 capitalists and other influential men are paying a visit to Mexico under the guidance of Mr. Stilwell. Among the members of the party is John F. Wallace, former chief engineer of the Panama Canal. The gross earnings of the National Railways for the third week of November were \$82,484 more than the corresponding week of last year, this being an increase of 7.3%. At the Sonora & Ures mine, which is on an extension of the La Blanca vein system, a small, rich ore-shoot was struck, and it is thought that this is an extension of the new rich vein found in the La Blanca recently. The Sonora & Ures mine is one of a number of the new properties that have been taken up and developed on extensions of the Santa Gertrudis and La Blanca vein system. To a Nevada 'boomer' it would be absolutely incredible that all of these extensions had not been taken up and worked long ago, in view of the fact that the vein system is known to extend beyond the limits of the properties of the Santa Gertrudis, La Blanca, and Barron, both on the strike and on the dip. Nearly all of the ground has now been denounced, but it has not yet been explored. Diamond-drilling would be an easy means of testing the value of the extensions of these veins. The above condition is all the more remarkable in view of the success of so many of the established mines at Pachuca. For example, the San Rafael y Anexas paid a monthly dividend of \$86 per share. The Santa Gertrudis is paying regularly \$1 per share per month, or approximately 12% per annum on the par value of the shares, and this, notwithstanding the fact that the company is erecting its new mill and cyanide plant out of the profits without curtailing the 12% dividend. Other notable monthly dividends are Maravillas \$4; San Francisco Hacienda \$2, and Guadalupe Fresnillo \$5 per share.

R. A. Lyman, assistant general manager of the Real del Monte company at Pachuca has resigned.

Three large properties in the Santa Barbara district of Chihuahua are being operated by the El Rayo Mining & Development Co., treating on an average 4500 tons per month by the cyanide process, with good results. A large 250-ton mill is to be erected about seven miles from Parral; between the towns of Minas Nuevas and Parral. A spur is being built to the mill-site from the new Parral & Durango railroad; the manager for the company is James J. Long. The Batopilas Mining Co. controls about 1600 acres of titled mining property in the Batopilas district of Chihuahua. Besides this, the company obtained a Federal concession covering the mineral rights to about 61 square miles of territory in the same district. The Batopilas Mining Co. was formerly controlled by Alexander R. Shepard. A new company has now been formed in England with a capital of £300,000 under the title of the Batopilas Mining, Smelting & Refining Co., Ltd. According to a report just issued by L. H. Stephens, president of the old company, a contract has been entered into with the new one by which the latter will lease the existing mines, mills, and haciendas. This will include the Todos Santos, Cinco de Mayo, Ballinas, and San Miguel properties. Under terms of the lease the new company will increase the output and will also make improvements in the 100-ton mill, and will erect a large cyanide plant. It appeared that the old company will receive and control 250,000 out of the 300,000 shares of the new organization, and that the latter will pay off the bonded indebtedness of the old concern, including principal and interest. The term of the contract is for 25 years. Gilmore Goodland, an English mining engineer, has been making examinations and reports on the properties. Alexander R. Shepard, Jr., will remain as general manager.

The Cole-Ryan interests are extending the plan of operations at the Sierra Consolidated Mines Co.'s properties at Ocampo, Chihuahua.

The El Rayo Mines Co., owning mines near Santa Bar-

bara, Chihuahua, has been making net returns of \$5000 to \$20,000 per month, and this month a quarterly dividend will be declared, payable in January. The capitalization of the company is \$75,000.

A rich ore-shoot has been struck in the Dos Cabezas mine near Casas Grandes, Chihuahua, and extensive development work is in progress. Additions are also being made to the working force; the new main shaft has been completed; and the additional machinery which was ordered some time ago, is now being erected. The company is making plans for the construction of a smelter near the mines. J. L. Hirt is manager. It is rumored that the Candelaria Mining Co. has sold the well known San Pedro silver mines to F. S. Pearson. These are in the San Pedro district in the northern part of Chihuahua, on the line of the Rio Grande, Sierra Madre & Pacific railroad. The construction of a railroad from Durango to the Murphy tract seems to be now a settled fact. It will be 100 kilometres long and the estimates call for an expenditure of \$2,000,000. It is also stated that three branches will be built, and that a large creosoting plant will be installed in conjunction with the enterprise. Besides opening up a valuable timber and agricultural tract, the road will facilitate the development of a number of mines.

The contract for the building of the waterworks and drainage systems of Chihuahua has been awarded to the Cia. Bancaria de Obras y Bienes Raices of Mexico City. The Palmilla Milling Co. has ordered machinery for a 1000-ton mill from the Allis-Chalmers Co., and has also ordered machinery for a steam-electric central station power-plant from the Minneapolis Steel & Machinery Co. The steam engines will be cross-compound condensing Corliss type, direct connected to the electric generators.

The news comes from Sonora that two large companies have merged their interests, the Douglas Copper Co. and the Mexican Exploration & Mining Co. The Douglas Copper Co. owns the El Cobre mines and the smelter at Fundicion which is on the Southern Pacific of Mexico railroad. The smelter is designed for an ultimate capacity of 1000 tons, and has one 350-ton unit completed. The Exploration company owns a valuable mineral concession covering 1,500,000 acres, west of the Yaqui river, and north of Cumuripa. More than 50 locations have been made on this tract, and the developments have shown sufficient fluxing ore for the output of the El Cobre mines. The new company which will control the merger has a capital of \$6,000,000 common stock, and \$2,000,000 of 7% preferred stock; \$1,500,000 of common and \$600,000 of preferred stock have been reserved in the treasury.

CHICAGO.

Cherry Disaster.—Work of the Helmet Men.—Mine Rescue Stations.—University School of Mines.—Fire Protection.—Indemnity Insurance.

The Cherry disaster continues to be the main topic of conversation. It will be recalled that early in the year a Mine Rescue Station was established at the State University by the United States and State Geological Surveys, jointly, and R. Y. Williams placed in charge with J. R. Webb as assistant. Since its establishment the State Mine Inspectors have heartily co-operated, becoming themselves thoroughly familiar with the apparatus and frequently calling on the men in charge for assistance in fighting mine fires. The results accomplished at Cherry by the Inspectors and the men from the Station afford an appropriate occasion for reviewing the work so far done. The main object in establishing the Station was to demonstrate the use of the new mine rescue tactics, to train men in the use of the oxygen breathing apparatus, and to study the mining conditions in the Eastern Interior coal field, with a view to lessening the hazards of coal mining. When the engineers from Urbana, with their 1300 lb. of baggage arrived at Cherry, the shafts were sealed and rescue work at a standstill. This sealing of the shafts was caused by both shafts being on fire, and it was, naturally, unwise to allow any ventilation to pass through the mine under these conditions. Considerable quantities of water had been poured down the air-shaft in order to try to put out the fire, but there was no assurance

that this had been successful until the oxygen helmets were used to enable the men to make a thorough inspection of the air-shaft and the entries immediately contiguous on the upper level. When this inspection had showed that the fire was out in the immediate vicinity of the air-shaft, it was considered reasonably safe to descend the hoisting shafts with a view to establishing circulation sufficient to cut the smoke, and fight the fire at the foot of the hoisting shaft and between that and the air-shaft. Inspections of the hoisting shaft were made with the aid of helmets before this air was turned in, but the smoke was so thick that the fire could not be found. After the starting of the fan, the flames were easily discovered and the hose taken in by the helmet-men in an endeavor to extinguish the blaze, but at this critical juncture, it was evident that there was no head of water obtainable, and, consequently, the shafts had to be re-sealed until a dependable supply of water could be had. As soon as this was obtained and the firemen from Chicago were on the ground to render their ready and valuable assistance, the shafts were again opened and the fire controlled sufficiently to allow the progress of the rescue work. One week after the fire had started, while a corps of rescuers was digging through a wall 600 ft. from the shaft on the west side, voices were heard and eight entombed miners were found to have walked and crawled 3000 ft. from the head of an entry where they had walled themselves off a week previous. These men told of 12 of their companions who were on the inside of this barricading wall and who were too weak to join the eight who had found their way to the shaft. Owing to the presence of black damp, it was impossible for the rescuers to enter the region through which these eight men traveled. Consequently, ventilation was established in these entries and carried to within 100 ft. of the barricade wall. At this point the helmets again showed their ability to handle situations which heretofore would have been impossible. With their aid volunteers rushed through the black damp to the place where the 12 men were confined, and rendering them support, brought them out to the point where there was ventilation, and restored them with pure oxygen before sending them to the surface. Some of the men, obtained in this way with the aid of helmets, were unconscious, and the temperature of their body was low, but they were all revived by means of the oxygen treatment. It is thus evident that with the aid of the oxygen helmets the Cherry mine was opened up a number of days earlier than it would have been otherwise possible, and also that when the live men were discovered 12 were immediately rescued with the helmets, whereas without the helmets there would have been necessary delays and the possible loss of the men.

Several other cases where the helmets have been used to advantage may be cited. At the time of the explosion of Dering 18, West Frankfort, Illinois, in February, 1909, the helmets were used to assist in sealing the air-conduit leading between the air-shaft and the fan; and at the same mine on June 7, an inspection of the air-shaft from top to bottom was made by men wearing the oxygen helmets. During the summer at the Hart-Williams mine, Benton, Illinois, a fire originating from a blast of black powder was sealed up temporarily. Five days later the oxygen helmets were used to inspect the seat of the fire, to erect brattices, and to remove the large amount of explosive gas that had collected. The fall caused by the fire was then loaded out. At Moweaqua, Illinois, last September, a fire that originated in the timbers at the main shaft-bottom was successfully handled with the aid of the Urbana apparatus. This was a very serious fire when discovered, and the helmets showed clearly that the only alternative would have been to have sealed the shafts indefinitely. During December at the Majestic mine, near DuQuoin, Illinois, a fire that had raged ten weeks previous, was extinguished with the aid of the new mine rescue tactics. Owing to circumstances at the time of the fire, fully 40 acres had been sealed off, and had filled with marsh gas during the intervening period. The helmets were used to allow inspection of the immediate fire region, and to assist in the removal of this enormous quantity of gas, after which the heavy fall that had been caused by the fire, was loaded out. During this work, the coal

again began to glow, but the fire was controlled with the aid of fire extinguishers. It is evident that the Station is accomplishing much good and it has already won the enthusiastic support of miners, operators, and inspectors. It is hoped that district stations will be established and equipped throughout the Middle West by the co-operation of the operators, so that the apparatus and corps at Urbana may devote more time to general studies and the training of men.

In part as a result of the establishment of this Station, a mining school has been organized at the university in response to the request of the operators, miners, and coal users. H. H. Stoek, already well known in Illinois through his connection with *Mines & Minerals*, has been called to its head, and is now organizing the work. It is planned to develop courses especially for coal miners and the department announces that it stands ready at any time, by lectures or other means, to co-operate with and assist any organization in the State that aims to help those who are preparing to take the examination for Mine Manager, Examiner, or for Hoisting Engineer, or which aim to assist the ordinary miner to better understand his daily work.

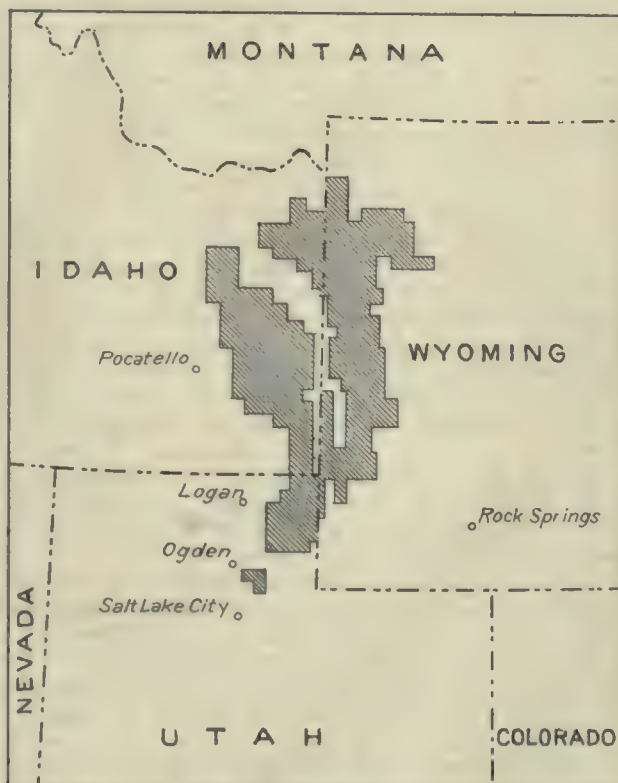
The mining and metallurgical industry of Illinois represents an output valued at approximately \$150,000,000. The general public is, however, so accustomed to consider Illinois as agricultural, that it does not realize that the State ranks third in the amount of mineral and metallurgical output, being surpassed in this respect only by Pennsylvania and Ohio. For many years Illinois has occupied second place among the coal-producing States, and the rapid development of the iron industry about Chicago and around the southern end of Lake Michigan has already placed it well up among the iron and steel producing States. As a producer of petroleum, of clay, and of sand products, also, Illinois stands well toward the front. It is, therefore, eminently fitting that the mining industry should be represented in the State University and the Department will evidently find abundant opportunity for good work.

A special session of the General Assembly has been called by the Governor, C. S. Deneen. Among the matters recommended for legislation are several touching mining. Better protection from fire and the provision of adequate fire-fighting apparatus is recommended and doubtless will be required. In the face of the loss at Cherry its need can not be denied. The Mine Casualty Committee of the Operators' Association has already had the matter up and a number of companies have taken independent action. There will always, however, remain a few that can be reached only by legislation and in any event a law setting minimum requirements is desirable. Another matter recommended by the Governor is a commission to study industrial indemnity insurance. There is a strong movement toward the creation of a fund by means of a tax on each ton of coal mined, to be used to relieve dependents in cases of accidents. The excessive cost and waste of the present method whereby the bulk of the money goes to contesting claims, has been abundantly shown and such a tax would be in line with the modern doctrine that each industry should provide for its own losses. If the matter can be adjusted so as not to upset present competitive conditions among the coal fields, it will not be opposed, but it is not easy to see how this can be brought about. It is rumored that the United Mine Workers of America will include in their demands next spring, one for a flat increase of 10% in wages, the money to be paid into such a fund. This plan has many advantages since the agreement would, if so effected, be inter-state. It has the defect that non-union districts would be given further advantages in the markets and that in any event the operators would not be relieved from legal obligation, damages, nor would they be protected from suits. This, of course, would be unjust. Evidently the commission Mr. Deneen has asked for is needed. The productive capacity of the mines greatly exceeds the annual demand. There is ruinous competition and small operators are being driven out of business and combination to regulate production is out of the question because of the anti-trust laws. These economic conditions are largely responsible for the present waste in mining and in part for the large loss of life.

WASHINGTON, D. C.

New Bureau of Mines Bills.—Conference for Uniform State Laws.—Phosphate Land Legislation.—Land Withdrawals in Montana.

The second session of the Sixty-first Congress, which convened Monday, December 6, was not a day old before a number of bills calling for the establishment of a Bureau of Mines in the Interior Department had been dropped into the legislative hopper. It will be remembered that the last House of Representatives passed such a bill by an almost overwhelming vote, but the bill did not get an opportunity in the Senate, being called up in the closing hours and talked to death by Mr. Teller, of Colorado. At the extra session of Congress, bills were introduced by Charles Dick, senior Senator from Ohio, Joseph M. Dixon, Senator from Montana, William F. Englebright, of Nevada City, California, representative, William B. Wilson, of Blossburg, Pennsylvania, representative, Harry M. Coudrey, of St. Louis, Missouri, representative, and Albert Douglas, of Chillicothe, Ohio, representative. All of these bills are still alive, and will remain so until one bill is passed or the Sixty-first Congress ends. This week three more bills have been in-



Western Phosphate Lands.

troduced in the House of Representatives, calling for a Bureau of Mines, one by Martin D. Foster, of Olney, Illinois, one by Richard W. Austin, of Knoxville, Tennessee, and one by Charles N. Pray, of Fort Benton, Montana. These bills follow in a general manner the previous ones, with the exception of that offered by Mr. Pray, who would give the Commissioner of Mines a salary of \$7500 per year. All of the bills provide for the transfer from the United States Geological Survey of the work now being done by the Technologic Branch. That both Houses are determined to get early action on the bureau of mines proposition is seen in the fact that both committees on mines and mining have already held meetings and discussed the various bills. The House Committee, with George F. Huff, Greensburg, Pennsylvania, as chairman, has already indorsed the Douglas bill with certain minor amendments. This bill follows closely the bill passed by the last House, with the Senate amendments attached. It is impossible to learn just what changes have been agreed to until the bill is reported out of the committee.

On January 17, 18, and 19, an important national conference will be held in Washington between employers and employees and men high in the councils of the nation on

the subject of greater uniformity in State laws. President Taft has promised to make the principal address. One feature of the conference, and the one most interesting to the mining interests, will be a discussion of the need of uniform mining laws in the various States, especially in the coal-mining States, where different laws with different requirements, it is claimed, sometimes work hardships upon the coal operators. For instance the laws of certain States demand costly safeguards for the miners that are not required in other States, these adding to the cost of the coal in these States and giving the operators of the other States undue advantages. The conference in seeking this uniformity will endeavor to raise the standards of the States whose safeguard requirements are not adequate, and in this manner equalize the competitive conditions. John Hays Hammond, John Mitchell, and Joseph A. Holmes of the Geological Survey, are expected to aid in this movement.

Gilbert M. Hitchcock, of Omaha, Nebraska, representative, has introduced a resolution in the House calling for the appointment of a committee of seven to make a complete investigation of the conduct of the General Land Office during recent years with relation to coal lands and other public domain in the Territory of Alaska. Reed Smoot, Senator from Utah, has the honor of introducing the first bill at this session relating to mining. His bill provides for the utilization of the phosphate deposits belonging to the United States, and calls upon the Secretary of the Interior to restore to entry such of these lands as may be without prejudice to the United States, after they have been classified by the Geological Survey. The bill provides for a commission of three members which shall proceed to clear the title of these phosphate lands of all entries, claims, and locations invalid because of non-discovery of mineral, failure to perform the annual labor required by law, or because of failure to perform any of the material acts required by law as a pre-requisite to entry. The bill further provides that the Secretary of the Interior be empowered to issue leases to work the phosphate deposits on such terms as he may deem best.

John B. King, of Texarkana, Texas, is before the General Land Office with a unique proposition. He is evidently a shrewd citizen, and if he is successful in his contention, he will be richer by a sum estimated at \$5,000,000. Mr. King lives near Ferry lake, a body of shallow water, 4400 acres in extent, in Louisiana and Texas, in the famous Caddo oilfield. Several years ago Mr. King, according to his own statement, while prospecting over the general oilfield in the district where the lake is situated, discovered that while the Standard Oil Co. had located its wells on all sides of the property, no attempt had been made to locate on the lake. He then went to work, he says, and made a close examination of the records bearing on the question of title to the land on which the lake lies. This was formerly government land, before the backwater from the Red river overflowed and left the lake. He ascertained, so he claims, that the lake was never turned over by the general Government to the State of Louisiana, and he lost no time in making an entry on the 4400 acres in question. One year ago Mr. King made the entry under the placer-mining laws, and he is now before Commissioner Dennett endeavoring to perfect his title before beginning operations. He says that the lake is but two or three feet deep, and that it will be an easy matter to locate oil wells in all parts of the 4400 acres. The State of Louisiana, which it was thought would claim title to the lake, has not put in a defense. Mr. King is represented by former Representative John J. Lentz, of Columbus, Ohio.

Announcement has been made by the Interior Department that about 1,000,000 acres of land in northern Montana, reserved by the Government for the purpose of allotting it to Rocky Boy's band of Chippewa Indians has been restored to settlement and entry, and that the Indians are to be given allotments on a small portion of the Blackfoot reservation. For use in connection with the Fayette-Boise reclamation project, Idaho, Richard A. Ballinger, of the Interior Department, has withdrawn from all forms of disposition about 49,000 acres of land needed for the enlargement of existing reservoir sites.

GOLDFIELD, NEVADA.

Production.—Consolidated Mill.—Clermont.—Florence—Goldfield.

Production is maintained in the Goldfield district averaging well above \$200,000 weekly, with the Consolidated and Florence leading, and small shipments from a number of leases being sent to the local samplers. Official estimates place the output of the Consolidated for the month of November at 19,180 tons, with a gross recovery of \$635,000, and estimated net profits of \$480,000. Final returns have never, thus far, failed to surpass the estimates given out by the management. At the Consolidated 100-stamp mill on Columbia mountain, additional equipment is being rapidly installed, which will increase the capacity of the plant to 900 tons daily. While the stated capacity of the mill as first constructed was 600 tons daily, it has for several months been treating 650 tons. The new equipment includes six 6-ft. Chilean mills, 26 Deister concentrating tables, four 8-ft. Callow classifying cones, two additional agitators, an electric pump, compressor, and two elevators for hoisting the oversize back from the tube-mills to the classifiers. No additional structural work has been necessary, there being ample room in the present mill structure for the new equipment, and the refinery is capable of handling the product of the entire plant.

New stopes of large dimensions are now being opened in the Clermont workings on the 750 and 900-ft. levels, as well as on intermediate levels between the 600 and 900. The west cross-cut, at the 1000-ft. level, toward the Mohawk vein, is out over 400 ft. and is expected to penetrate the vein opened above early in January. At this depth the formation is identical with that at 900 ft., where large bodies of ore are exposed for a distance of 350 ft., the ore being of excellent milling grade, and averaging 20 ft. wide. The best showing is still at the 750-ft. level, where the sill-floors are 25 ft. wide, and for the entire width the ore averages \$500 per ton. Beyond this width are additional bodies of good milling ore. In one raise from this to the 600-ft. level the ore broken averaged nearly \$3000 per ton throughout. In this orebody are many seams carrying free gold and telluride in large quantity. Good ore has been followed in driving to the south on a cross-vein for 70 ft. from the main vein, and a stope 8 ft. wide is being opened on this lead at an intermediate level. The 750-ft. level has now been driven 900 ft. from the Clermont shaft to a point from which a raise will tap the deposit containing some of the richest ore found in the Mohawk. Other raises will connect with the orebodies of excellent character opened in drifts from the 50-ft. winze below the great stopes at the southeast of the Mohawk. The 600-ft. northwest lateral from the Clermont has penetrated the Red Top vein at the point where it turns to the west, and below the stopes at the 260-ft. level, but no ore of high value has been found at this depth in the vein. A large tonnage of excellent milling ore is being opened in cross-cuts driven into the foot-wall of the main Mohawk ore-shoot where 20 ft. of \$30 ore has been opened. South on the Mohawk the work has had equally good results in driving under the old lease-stopos, and a good vein of high-grade ore has been opened nearly to the boundary of the Combination Fraction. An old cross-cut at the third level to the west is being cleaned out and will be extended into the Combination, cutting through the country rock a short distance north of the Hampton stope. Throughout these mines development is being pushed as never before in order to prepare for the increased demands of the mill. The company now employs about 750 men and its payroll for November approximated \$80,000.

The past three months have witnessed a large increase in the ore reserves of the Florence-Goldfield mine, and the perfection of the mill to a point rendering it one of the most economical and efficient of its capacity in the State. With a new 200-ton gyratory crusher and other improvements, the plant is now treating 160 tons of ore per day and making a highly satisfactory saving of the gold content of the ore. The new mill-superintendent has dispensed with the use of blankets, which were employed on a portion of the plates, and has resumed direct amalgamation with the result that in some of the product 60% of the gold is being saved as

the amalgam and 40% of that formerly contained in the concentrate, making an appreciable saving in transportation expense. Troughs, launders, and other woodwork, with which the ore has come in contact in various stages of treatment, have been subjected to a thorough cleaning, and a considerable amount of gold recovered that had adhered to them. Shipments of concentrate are made regularly to the smelters, and the mine is now in condition to make good profits. It is stated that the ore reserves are ample in the territory adjacent to the company shaft and above the 400-ft. level to supply the mill to its full capacity for more than a year without further development. The mill-heads have lately approached an average of \$30 per ton.

The main workings of the C. O. D. Consolidated Co. on the Gold Bar claim have been acquired under lease for a term of five years by local and Eastern men, and active development will begin shortly to open the mine at depth, and the lessees will soon begin the construction of a 50-ton mill. The lease embraces 20 acres, with veins from which a considerable tonnage of high-grade ore has been produced. It is estimated that there is already available on the dumps, and broken in the workings, 1000 tons of \$25 ore that is free milling. The mine is equipped with an excellent hoist-



Florence Mine, Goldfield, Nevada.

ing plant and a 3-drill compressor, which will be supplemented by additional power. It will require a month to clean up the workings and install a higher head-frame, after which the 325-ft. shaft will be sunk to the 500-ft. level, and the veins will be explored at that depth. The enterprise is headed by B. E. Thomas, who has exposed shipping ore in his lease on Columbia mountain, and it is designed to have the mill on the Gold Bar treat the product from this lease. L. K. Koontz, manager of the C. O. D. Consolidated, has announced that he will develop the Victor claim and veins from which a good yield of high-grade has been made in that ground, from the 600-ft. shaft of the Gold Ore Mines Co. on the north line of the Gold Bar claim.

Development on the Nancy Donaldson, in the eastern part of the district, has exposed some pay-ore at the 125-ft. level, and driving is in progress on the vein from which assays were secured at the surface running into thousands of dollars. The shaft has been heavily timbered, adequate mining machinery installed, and sinking will be continued. The vein has a foot-wall of porphyry and quartz, characteristic of the productive veins of the district. Lessees on the Goldfield Daisy are producing a small tonnage of good ore. A new hoisting plant has been installed on the Millard-Jones lease on the Daisy, where shoots of high-grade ore have been opened at two points. The Belmont continues to take out shipping ore, and the workings of the company are being extended at depth. Atlanta lessees are working energetically and opening new territory near the extension of the Clermont vein. Shipping ore is being broken in the original St. Ives workings by William MacKay and associates, and have also leased the main shaft of the Merger Mines Co. Medium-grade ore is being shipped from the old Graham shaft on the Daisy. The demand from the smelters for silicious ores has caused a reduction in charges made by local ore-purchasing and sampling companies to \$9 per ton on some classes of ore, and this will afford an outlet for a large tonnage of the Goldfield product.

LONDON.

New Process at Broken Hill. — Gold Mining in Wales. — Lancefield and its Difficulties.

Considerable interest has been evoked by the receipt of information in London relating to a new development of Broken Hill metallurgy, by means of which the slime at present untreated will be made available. The proportion of the contents extracted at Broken Hill has, perhaps, been less than at any other great mining centre. Owing to the extremely intimate mixture of the blende and galena and the presence of a heavy gangue, ore dressing has always been difficult. At first it was supposed that some smelting or leaching process might be applicable, but though many were tried the extraction was poor and the cost high. For many years operations were confined to jigging out a silver-lead concentrate, which, in most cases, was sufficient to provide profits. But this process did not recover more than a third of the metallic content of the ore. The zinc middling, as it used to be called—or zinc tailing, to give it the modern name—was useless, as was also the slime formed in the original crushing operation. The zinc tailing is now handled successfully by the various flotation processes, and according to the news at hand this week, there is a prospect of slime being utilized. Some mines produce more slime than others, but probably the average slime contains one-third of the whole value of the ore and its entry into commercial metallurgy is obviously of importance. The new process has been invented and developed by E. J. Horwood, manager of the dressing department at Broken Hill Proprietary. It consists of first separating the zinc and galena from the gangue by the flotation process and then giving the concentrate a roast at a dull red heat, which is sufficient to sulphatize or oxidize the galena, but not to affect the blende. The mixture is thus made amenable to the flotation process by which the zinc will be floated off and the lead left behind. The roasting will have to be done with exceptional accuracy, for the temperature must be kept within narrow range. The process will be applicable to many of the Tasmanian ores. Its use is not confined to slime. If coarser concentrate be treated it will not be necessary to completely sulphatize or oxidize the galena, but only to give a sufficient roast to provide a coating of sulphate or oxide. This would be sufficient to prevent the oil having any effect on the lead. I should like to see it tried on some of the complex Georgetown ores.

We occasionally hear of gold mining in Wales, and though various mines are worked energetically from time to time, the deposits are generally of too low grade, and produce disappointing results. The St. David's, near Dolgelly, is a recent example. For a few years the extraction was satisfactory and large sums were spent on new plant and development along the best lines, and as approved by mining engineers of the front rank. The mine is now, however, in a bad way. Perhaps one of the most interesting endeavors to conduct gold mining operations in Wales is that which is now under way at the Ogofan mines, in Carmarthenshire, not very far north of Swansea. These workings are so ancient that records are lost, and it is supposed that they were worked in the days of the Romans. The district is a favorite one with antiquaries, for there are Roman camps, aqueducts, and similar remains. The workings are in the form of quarries 80 or 100 ft. deep, and the sides being now covered with trees and other vegetation, the cliff scenery is quite a feature of the landscape. By computation it is reckoned that quite 4,000,000 tons were taken out in ancient days, and probably it was all oxidized ore. At various points auriferous pyritic and arsenical quartz veins are found, and it is on these that the present owners have started driving and sinking. The gold content varies, but averages 11 dwt. The results of the work are awaited with interest. A 5-stamp battery and a Wilfley table have been erected.

The Lancefield gold mine, at Laverton, Western Australia, has presented a number of metallurgical difficulties during its short history, but these appear to have been overcome, and the mine should now settle down to profitable production and become one of Bewick, Moreing & Co.'s best. The

company was first formed in 1904, and re-constructed in 1908. The ore first found was free-milling, but this changed rapidly, the ore becoming complex and presenting serious metallurgical difficulty. Arsenic came into the pyrite and the ore was hard. Dry crushing and roasting was adopted, but the presence of the arsenic and the hardness of the rock caused the output of the plant to be much less than anticipated, and the cost of treatment became correspondingly high; so high as to wipe out the margin of profit. The alternative was to increase the plant, and for this purpose additional capital was required. When the company was re-constructed in March, 1908, £30,000 working capital was obtained. Subsequently 100,000 preference shares of 10s. each were created, thus bringing up the nominal capital of the company to £200,000. The report now issued covers the period from April 1908, when the company was re-constructed, to June 30 of this year. Operations, both on the surface and underground, were suspended in July, 1908, and attention was concentrated on the treatment plant. After a thorough examination of the problem by W. J. Loring the building of six roasting furnaces was commenced in December, and in April, 1909, three were started. A fourth was brought into operation in July of this year, and the remaining two have since been completed. When the equipment is completed the monthly capacity will be 10,000 tons. Underground development was re-started in January of this year, and has since that time been continuously and actively pursued. From that date to June 30, 72,065 tons of ore have been developed, bringing the reserve to 165,234 tons containing an average of 34s. per ton, and the main shaft has been sunk to a depth of 665 ft. During the period under review, the extraction plant was working part of the time, and treated 28,389 tons with a recovery of 9537 oz., which was increased to 9848 oz. by the treatment of slag. The income from this source was £41,880, which was not sufficient by £15,390 to pay for current expenses, and did not include depreciation, development, or cost of new plant. The efficiency of the plant has increased during the last few months. In July the extraction was 80%, and by October it had increased to 86%, leaving 4s. 9d. in the residue. It is expected that eventually not more than 4s. will be left unextracted. If we take the average content at 34s. this will mean an extraction of 29s. The engineers are expecting to bring the costs down to 23 shillings.

BUTTE, MONTANA.

Tuolumne Controversy with North Butte. — Butte-Ballaklava. — Gold and Silver Output

Edward Hickey, president of the Tuolumne Copper Co., has issued a statement to stockholders relative to the controversy with the North Butte company over the rich vein on which the Tuolumne company is mining, and which the North Butte claims to be the Jessie vein of the North Butte company and belonging to the latter. To determine the rights of each the two companies are engaged in making extensive developments and surveys in the disputed ground. Since this work has been going on the Tuolumne engineers have evolved the theory that the Tuolumne and Jessie veins are separate and distinct until they reach a depth of 1200 ft., where the Jessie unites with the Tuolumne and the two form one vein, the Tuolumne claim being the older location thereby becoming the owner of the united vein from the point of junction. This is a new theory and an interesting one for North Butte owners. In his statement Mr. Hickey calls attention to the fact that the Tuolumne, consisting of six acres of surface ground, is entirely surrounded by North Butte and Amalgamated mines, and that it would therefore "be immensely desirable to them if one or the other could acquire the Tuolumne mine." Mr. Hickey says that two good veins apexing in the Tuolumne ground have been developed by the company, and one of them is the richest ever discovered in the Butte district, while a third, the largest of the number, has been cross-cut at a depth of 1800 ft. by some other company from an adjoining property. An interesting phase of the controversy lies in the fact that information from North Butte sources is that the Tuolumne and North Butte workings have come together on the 1400-

ft. level of the Tuolumne, showing that they are both on the same vein and the same orebody. Tuolumne officers say this is not true. The control of Tuolumne rests with about four or five stockholders and control of their stock could not be had at other than a satisfactory price, and not unless the same price paid them for their stock should be offered to every stockholder of the Tuolumne company for his stock. The statement of Mr. Hickey caused quite a sensation, and it was regarded that the important and significant feature was in the practical admission of an existing controversy with the North Butte and the possibility of litigation over the Tuolumne's big vein.

The Butte-Ballaklava Copper Co. will have its shaft completed to the surface by the first of the year, when a new hoist will be installed and the production increased. From the surface to the 500-ft. level the shaft was only of two compartments, while three compartments were made from the 500 down to the 1400. The additional compartment is being raised from the 500 to the surface. While that work



Montana.

has been going on mining was confined to the 100 and 300-ft. levels, from which some high-grade ore has been shipped, yielding about 7% copper and 50 oz. silver per ton.

According to the deposits made at the United States Assay Office at Helena during the first 11 months of 1909, and estimated for December, Montana produced this year \$1,517,387 in gold and silver, the different counties of the State contributing as follows:

| County. | Total value. |
|-------------------------|--------------|
| Beaverhead | \$ 739.20 |
| Broadwater | 17,133.09 |
| Chouteau | 659,506.14 |
| Deer Lodge | 17,539.68 |
| Fergus | 659,955.59 |
| Granite | 11,004.20 |
| Gallatin | 50.18 |
| Jefferson | 9,776.83 |
| Lewis and Clark..... | 91,332.91 |
| Lincoln | 331.45 |
| Madison | 451,121.95 |
| Missoula | 21,441.77 |
| Meagher | 624.81 |
| Park | 296.78 |
| Powell | 24,288.49 |
| Ravalli | 4,931.07 |
| Silver Bow (Butte)..... | 10,634.83 |
| <hr/> | |
| \$1,980,708.97 | |

The amount received at the Assay Office in 1908 was \$1,575,682, and in 1907 it was \$1,517,387. Practically no silver was shipped to the Assay Office from Butte, this year's total amounting to only \$64.70. Nearly all the gold and silver produced in Butte are by-products from copper, and are not extracted here, going to the refineries in the East, and they are therefore not reported to the United States Assay Office in Montana.

General Mining News.

ALASKA.

(Special Correspondence).—The operations of the Porcupine Gold Mining Co., on Porcupine creek, 40 miles from Haines, for 1909, resulted in putting the flumes and equipment in excellent condition and making a satisfactory run. The bedrock flume, 1987 ft. long, 6 ft. wide, and 4 ft. high, was finished in September. It was paved with riffle blocks the full length. The Lidgerwood trolley lift, having 2½-yd. steel buckets, with automatic dump, was put in operation late in the season. By this system the gravel is piped into the buckets at bedrock and lifted to the hopper that discharges into the sluice, at the rate of 400 cu. yd. per 20 hours. The main flume that supplies water for the giants and sluice boxes, is in perfect condition. Everything is ready for a full season's work next year, when it is estimated that 1200 to 1400 cu. yd. of gravel per day can be handled. The company expects to resume operations about May 10. E. E. Harvey, manager for the last three years, has resigned.

Seattle, December 18.

ARIZONA.

COCHISE COUNTY.

The Pawnee Mining Co., operating the Claire group, 18 miles west of Paradise, is shipping lead-silver-copper ore to the El Paso smelter.—Operations are to be resumed at the property of the Bonanza Belt Copper Co., at Johnson, after an idleness of two years.

GILA COUNTY.

(Special Correspondence).—It is expected that two of the new Nordberg pumps being installed in the 1200-ft. station of the Old Dominion mine, will be working by January 1. These have a capacity of 2,000,000 gal. per 24 hours, and will lift all the water from the 12th level to the surface. Below the 12th level electric pumps will be employed. Underground work at the Old Dominion mine is being done for the most part between the 10th and 15th levels. On the 1500-ft. level cross-cuts are being driven to cut the ore-body at the West fault. Two furnaces and two converters are in operation at the smelter.—In the cross-cut running north from the shaft on the Arizona-Michigan property an 18-in. silver-bearing vein with an east and west strike, has been cut at a distance of 130 ft. from the shaft. Since S. W. Clawson's resignation as general manager, which took effect December 1, N. A. Nelson, the superintendent, has had full charge of the Arizona-Michigan mine.—In the Jennie shaft of the Cordova property, in the Miami district, chalcocite running about 2% copper is being opened at a depth of 98 ft. Chalcocite was first cut at a depth of 84 ft. Churn-drills, for use on the north end of the Cordova property, have been ordered. M. E. McCarthy is general manager.—One of the two Star churn-drills to be used in prospecting the Schulze group of claims, owned by Samuel Newhouse and other Utah mining men, is now sinking the first hole in what is estimated to be the centre of the Pinal schist body of the property. It is believed by the management that this body of schist will contain copper.—The shaft at the Superior & Globe property is now 645 ft. deep. It is the plan to begin cross-cutting toward the Big Johnny vein at a depth of between 650 and 675 ft. H. V. Snell, of Globe, is superintendent.

Globe, December 18.

GRAHAM COUNTY.

The Keystone drill on the Celtic claim of the Copper-mines company is cutting through a hard quartzite all of which has shown a fair percentage of copper.

MARICOPA COUNTY.

William Oaches has secured an option on the Hauxhurst group 30 miles south of Wickenburg.—A new hoist and head-frame have been installed at the Interior mine and the foundation for a compressor is being constructed. F. X. O'Brien is manager.

YAVAPAI COUNTY.

The Mudhole mine, in the Walker district, which is credited with a large production, has been completely unwatered and sinking resumed in the main working shaft.—Dyson & Taylor have taken over the Eberhart mine in the same district and have 15 men at work in the property. Some good ore has been opened and the operators will install a compressor and hoist.—The Arizona Bonanza Mining Co. has purchased a boiler and 40-hp. hoist, and will install the machinery at the property in the Big Bug district. J. H. Farrel is manager.—The drift at the Mount Tritle mine, in the Hassayampa district, is in 650 ft., the face being in a fair grade of sulphide ore.

YUMA COUNTY.

A station is being cut in the adit of the Bowyer Gold & Copper Co., in the Dome Rock range, and a 25-hp. hoist will be installed.

CALIFORNIA.

NEVADA COUNTY.

The company operating the Alaska mine, at Pike City, has decided to continue operations and will sink the shaft several hundred feet deeper.

PLUMAS COUNTY.

The Plumas-Eureka mine, near Johnsville, which the Turner brothers have been operating under lease the past season, has been shut down for the winter on account of the stormy weather. The operators have opened a rich shoot of ore and milled a portion of it in the Plumas-Eureka mill, the ore being carried from the mine to mill on pack animals.—Considerable development work is being done at the Del Monte mine which was bonded to Nevada operators some time ago.

SANTA CLARA COUNTY.

A new shaft known as the Nones shaft on the property of the Quicksilver Mining Co., at New Almaden, is down 80 ft. on the vein in which the New Guadalupe Mining Co. opened a body of rich quicksilver ore.

SHASTA COUNTY.

(Special Correspondence).—W. L. Cole, superintendent of the Mountain Copper Co., Ltd., has been transferred from Martinez to Keswick to take charge of operations at the



latter point. This is taken to indicate that activities are to be resumed at Keswick if the smoke question is settled satisfactorily; plans for a new smelter are said to be ready. Development at the Hornet and Iron Mountain mines continues steadily, the new adit at the latter having opened a large amount of virgin territory. It is estimated that the production of the company for this year will be about 2,000,000 lb. of copper.—The electric iron smelter at Heroult commenced active operation December 20, producing from 15 to 20 tons of pig-iron per day. Graphite electrodes have been installed in place of the ones formerly constructed of carbon.—The Midas mine is producing at the rate of \$30,000 per month. The shaft is down 1400 ft., and over 100 men are employed.—The Gladstone is keeping 35 stamps dropping and producing approximately \$35,-

000 per month.—At the Milkmaid the new owners are preparing for work on a larger scale.—A dispatch from Boston confirms the report that the Guggenheim interests have secured a controlling option on the stock of the First National Copper Co., the holding corporation of the Balaklala. The smelter at Coram is producing at the rate of 1,500,000 lb. of blister copper per month. Two furnaces are in operation. About 700 men are employed at the mine and plant. Nothing has yet been done in regard to the construction of devices to overcome the escape of fume.—The Golinsky copper property is now in undisputed possession of Bernhard Golinsky, following a decision by the District Court of Appeals at Sacramento.—The Washington is being worked in a small way.—The Mammoth Copper Co. is actively developing the Rattlesnake silicious gold property.—The Bully Hill Copper Co. is reported to be producing at the rate of 1,000,000 lb. of copper per month.

Redding, December 21.

SUTTER COUNTY.

The Feather River Dredging & Concentrating Co. has been organized to dredge 24 miles along the channel of the Feather river above Yuba City. The company proposes to operate suction dredges reclaiming agricultural land and making the river navigable while obtaining the gold from the river bed.

TRINITY COUNTY.

The creditors of the Trinity Bonanza King Mining Co. filed a petition in the United States District Court, December 11, asking that it be adjudged bankrupt as its directors at a regular meeting, November 30, admitted the company's inability to pay its debts and its willingness to be adjudged bankrupt. The petitioning creditors are California Safe Deposit & Trust Co., by its receiver, E. J. Le Breton, \$9484, with interest since December 21, 1908, at 6%; Trinity County Water & Power Co., five promissory notes for \$50,000 each, and two for \$25,000 each, on which there is a balance due of \$230,813; and Neustadter Brothers, for supplies furnished, \$5083.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—During the last two weeks the capacity of the Capital mill has been increased from 125 to 250 tons per day, and additional Card tables have been provided.—W. Schraga, owner of the Hebrew property on Saxon mountain, has cut 2 ft. of quartz, which assays 150 oz. silver per ton. The discovery was made in sinking a winze 300 ft. from the entrance of the adit.—John Lind has started work on the Columbine mine. The adit, in 70 ft., is being driven ahead on a small streak of galena.—C. Runkle, lessee of the Colorado Central mine, has started a stope on a body of rosin blende that is 3 ft. wide. Shipments are to be made to the custom mills.—H. C. Fuller, of Boston, stated that work would be put under way in a short time in the construction of a 50-ton mill for the handling of the ore from the Centennial mine on Leavenworth mountain. D. Kennedy is manager.—Work was resumed this week on the Ramsdell mine on Lincoln mountain. The cross-cut is to be driven to intersect the Golden Jack vein. G. W. Teagarden is manager.

Georgetown, December 17.

(Special Correspondence).—A streak of ore 16 in. wide has been found in the drift at the Princess Alice mine on Fall river. The ore assays \$35 per ton gold and silver. J. F. Kaminky is manager.—A carload shipment of ore from the White mine on Red Elephant mountain was made last week that was settled for at 195 oz. silver per ton. R. B. Morton is operating the property.—A 6-in. streak of ruby silver has been uncovered on the Almaden mine. Assays of picked samples are 7710 oz. silver and 1.52 oz. gold, with 17% copper. A. Nelson is operating under lease.—Work has been resumed on the Cascade property, a former good producer.—During the month of November the Newhouse tunnel was driven 271 ft., making the total length 20,750 ft.—The working force at the Saratoga mine has been added to during the last few days and a heavy tonnage of ore is being broken. The product is to

be shipped to the Golden smelter as soon as the furnaces have been fired. John Owen is manager.—A heavy tonnage of ore is being mined in the Old Town mine, work being carried on through the Newhouse tunnel.

Idaho Springs, December 18.

GILPIN COUNTY.

(Special Correspondence).—A merger of a number of mines on Quartz hill was effected last week when the Phoenix-Burroughs group of claims was transferred to J. C. Jenkins and J. E. Lightbourn, as trustees. It is stated that a strong company is being formed and that a big campaign of development will shortly be put under way. The properties have produced \$5,000,000.—Gardi & Co., leasing on the Hall mine in Russell gulch, sent out a carload shipment of smelting ore last week that milled \$43 per ton gold and silver.—On an average three cars per week of smelting ore is being shipped by Ress & Co., leasing on the Iron mine. The product is worth from \$40 to \$45 per ton.—Outside people have secured a bond and lease on the Hughes mine situated on Bellevue mountain. Work is to be put under way in two weeks.—On the 400-ft. level of the Eureka mine a streak of free-gold ore has been uncovered



Old Town Mine.

that is 6 in. wide. Alongside of this is to be found 3 ft. of milling ore that is worth from \$18 to \$20 per ton.—The Skelton Milling & Reduction Co. has been incorporated to construct a mill that is to cost \$50,000. Custom ore will be treated.

Central City, December 16.

SAN JUAN COUNTY.

High-grade ore has been opened recently in the Detroit & Colorado mine, in the Silverton district. J. C. Bell is manager.—Suit has been brought by a number of Philadelphia stockholders against the Astor Gold Mining Co., operating near Silverton, to prevent those in control from transferring the company's property to the Gold Mining Co.—The adit being driven to tap the ore on the mill level at the Hamlet mine is in between 1500 and 1600 ft. This will open the vein over 500 ft. below the present workings from which a large amount of ore has been mined.—The experimental mill erected at the Intersection property, in Maggie gulch, has been running since the first of the month, and producing a good grade of concentrate.

SUMMIT COUNTY.

Electric drills are to be installed at the O'Reilly group, on the upper Blue river.—The roads from the Sallie Barber mine are in good condition and one carload of ore per day is being shipped.—The Country Boy mine has been closed down temporarily.—Dean & Sprague, leasing on Nigger hill, have made their third shipment of 20 tons of lead-silver-gold ore from the property.—Lessees are sinking a new shaft on the old mill-site at the Wellington mine and have opened carbonate ore at a depth of 50 ft. Two shifts are at work driving the adit that will connect with the old workings on the mill level.—Operations are being carried forward as fast as possible at the new smelter at Robinson though stormy weather has somewhat interfered with the work.

TELLER COUNTY.

Two new prospecting permits have been granted by the Gold Dollar company on its property on Beacon hill. The company is now mining about 50 tons per day.—E. J. Boughton has taken a lease on the property of the Ben Hur Mining & Milling Co., paying a flat rate of 20% of the output.—The Mary McKinney Mining Co. paid a dividend of 1c. per share on December 23.—John Sharp, operating a lease on the Abe Lincoln mine, shipped a carload of smelting ore from the 840-ft. level.—The Union Leasing Co. has opened a 3-ft. vein on the north end of the Proper claim that assays from \$15 to \$20 per ton. A shaft is down 45 ft. on the vein.—The Jerry Johnson Mining Co. paid a dividend of 1c. per share, amounting to \$25,000. A report made to the stockholders states that there is \$38,000 in the treasury and \$3000 worth of ore in transit.

IDAHO.

BONNER COUNTY.

A meeting of the stockholders of the Idaho Smelting & Refining Co. has been called for January 3, and J. Herbert Anderson, the president of the company, has announced that \$500,000 has been raised to operate the plant at Ponderay.

SHOSHONE COUNTY.

(Special Correspondence).—The Marsh Mining Co., controlled by Charles T. Cowell, B. F. Plummer, and associates, of Montana, has purchased the Cooney group of seven claims adjoining the Tiger-Poorman mine, at Burke, for \$150,000, one-fourth of which was paid in cash. A. A. Booth, of Spokane, has been appointed manager, and operations have commenced. Arrangements have been made to obtain electric power from the Hecla company, an air-compressor has been installed and work has begun with air-drills. The property is opened by adit No. 1, driven 250 ft. on the vein, and adit No. 2 cross-cutting the country rock 700 ft. and driven 130 ft. on the vein, 3 ft. of which is a lead-silver ore of shipping grade.—The United Lead Mining Co. has 20 mining claims near Osborn, in the Coeur d'Alene district, on which there is a system of veins of lead-silver ore. Two cross-cuts, driven by former owners, opened some of these veins. The lowest cross-cut is in 1700 ft., and on this a contract has been let for 1000 ft. of additional driving to cut other veins. E. W. Conrad, of Spokane, is manager for the company.

Wallace, December 18.

KANSAS.

CHEROKEE COUNTY.

(Special Correspondence).—A new company, the Doherty, Devitt & Sapp, has been recently organized to prospect a 160-acre tract south of Galena along Shoal creek and a contract let for 1000 ft. of drilling.—Four drills are now at work on the Taylor-Foster land recently purchased for \$12,000. After the land is thoroughly prospected the tract will be sub-leased.—A steam pump has been installed at the Monte Cristo by John Fitzgerald, and the old mine will be unwatered.—Schmidt brothers, who have been busy developing a prospect in Cave Springs, adjoining the Herald mine, have now reached the stage where a mill is necessitated. The old Equitable 200-ton mill has been bought by the company and will be removed to the new lease.—Galena now has an open-cut mine, the Newton, the only one in camp. This property showed ore at only 12 ft. below the surface, and the upper barren stratum was stripped off and the ore taken out directly from above. A 45-ft. vein is disclosed. The ore runs only 3%, but is soft and easily milled.

Galena, December 17.

MISSOURI.

JASPER COUNTY.

(Special Correspondence).—The past fortnight has witnessed the transference of a number of important mining properties in this district. The 8-acre lease of the Excelsior Mining Co., at Four Corners, was bought by William Babson for a consideration of \$20,000. Recent drill-holes put down have disclosed a much better run of ore than hitherto and the drifts driven have opened a good face of ore

from 70 to 100 ft.—A 40-acre lease on the Staples land has been taken over by H. L. Kramer who has started drilling. A fair run of ore has been worked in one corner of the lease, and efforts will be made to prospect further. Mr. Kramer is already heavily interested in the Badger camp, where a large plant is in steady operation, and a number of innovations in milling practice are meeting with success.—William Goyer, of Chicago, bought a 40-acre tract of the Luke & Ash land west of Joplin upon which is situated the Sampson mine and mill for \$30,000. Mr. Goyer has held the land under lease the past year. Luke & Ash still own a 200-acre tract adjoining this land.—The Nowatt Mining Co. has bought a 50-acre tract of the Gray land for a consideration of \$15,000. This company has been drilling the property for some time and in 11 holes have struck ore from 85 to 100 ft., and a second run at 164 ft. The cuttings run from 8 to 10%. The company will begin the erection of a 300-ton mill at once and continue to prospect the remainder of the land.—Frank Nicholson has taken over a 20-acre lease on the Rex land, and has already made several turn-ins. Operations are conducted at 106 ft. in soft ground which requires timbering. Mr. Nicholson already owns the Missouri Mule at Webb City, the Hyde Park, at Porto Rico, and the Katherine at Zincite, in addition to the new property.—A lease of 10 acres on the Robb land, southwest of Joplin, has been sold to S. S. Bissell, of St. Louis, for \$20,000. The lease is well prospected, a mill has been erected on the property.—A 400-ton mill is to be erected on the Gallagher lease in the disseminated ground of West Joplin. The land has been tested by 14 drill-holes, which fully warrant shaft-sinking.

Joplin, December 16.

MONTANA.

DEER LODGE COUNTY.

The Allen company has operated a hydraulic elevator and two giants in placer mining at French Gulch, 21 miles south of Anaconda, the past season. Their ground runs from 7 to 20c. per cubic yard.

GRANITE COUNTY.

The Gold Reef Mining & Milling Co., managed by Oliver B. Finn, has just completed a cyanide plant as an addition to the stamp-mill on its property, situated eight miles from Philipsburg.

MADISON COUNTY.

A vein of tungsten ore from 12 to 18 in. wide has been cut on the property of Henry Schmidt near Twin Bridges. The value of ore so far opened approximates \$365 per ton.

NEVADA.

ELKO COUNTY.

The roads near Midas are in bad condition on account of the rainy weather so the work of hauling in the machinery for the mill of the Rex Mines company has been greatly delayed.—The Gold Circle Crown Mining Co. is to drive an adit to connect with the shaft sunk by the Snowstorm Leasing Co. Considerable work has been done on the property and three shoots opened.—At the Elko Prince a drift is being run on a 2-ft. vein that assays \$18 per ton.—A pump and hoist have been ordered for the Glasgow & Western and a shaft will be sunk on the Eastern Star claim.

ESMERALDA COUNTY.

Operations have been resumed in the Combination Fraction. On the 500-ft. level two drills are running, driving and cross-cutting, and the shaft is being sunk from the 600-ft. point.—A. C. Elslen and associates have secured a 25-year lease on the Mayflower Consolidated property and formed a new company, the stock of which is assessable.—The size of the transformer house at the Florence mine has been doubled and three new transformers added.—At the Polverde claim the shaft of the Goldfield Annex is down 700 ft., and is now in the latite.—The shaft on the Goldfield Mining & Ore Reduction Co. property is being unwatered and operations will be resumed on the 425-ft. level. The vein at this point is 6 ft. wide, and assays from \$5 to \$7 per ton.

HUMBOLDT COUNTY.

(Special Correspondence).—A reserve of ore valued at \$40,000 has been opened by the adit, raise, and winze at the Signal Peak-Consolidated properties. The orebody is said to be about 2 ft. wide, with assays averaging \$20 per ton. If sufficient water-power can be developed it is probable that a small mill will be erected in the spring. John Cleghorn is manager.—Mazuma Mines lease, on Mazuma hill, is shipping small quantities of high-grade ore. The 50-ft. winze from the 300-ft. level has intersected an 18-in. shoot of milling ore. The shaft is going down at the rate of 1 ft. per shift.—A 2-ft. vein of rich silver ore has been opened in the new shaft of the Good News. About 8 in. of the ore is said to assay \$500 per ton in horn and ruby silver. H. C. Reich is manager.—The Durango Girl is shipping small quantities of rich ore.—A number of properties in the Seven Troughs district are active.—It is reported that Eastern capitalists have become interested in the National Consolidated, the Stall brothers' claims, and other properties at National.

Rosebud, December 17.

NYE COUNTY.

(Special Correspondence).—Diamond-drilling from the 1500-ft. level of the Mizpah shaft of Tonopah of Nevada has commenced. It is reported that the shaft will be sunk to the 2000-ft. point. Owing to interference with slime settlement by the unusually cold weather, only 88 stamps were in operation last week. More heating pipes are being installed to overcome this difficulty. The mill is making an average extraction of 90%.—The Clifford properties at Ellendale continue to make small shipments of rich ore to the Hazen sampler.—A promising body of ore has been opened on the 480-ft. level at the Liberty. T. S. Carrahan, the manager, is authority for the statement that sufficient ore is blocked out to warrant the installation of 10 stamps.—The Williams, Beatty, and other lessees on Denver estate of Tramp Consolidated, are shipping steadily.—The Covert lease, on National Bank, recently made a small shipment of high-grade ore.—Driving under the vein on the 300-ft. level of the Pioneer is well under way. A strong body of quartz has been cut at the 330-ft. level, but assays are lower than in the upper workings.—It has been decided to sink the 120-ft. shaft at Bullfrog Mohawk to the 200-ft. point, and cross-cut for the main orebody. Considerable water has been found in the new workings.—The Marvel mine, near Lida, reports the uncovering of ore assaying 30% copper.—At the Cincinnati, in the same district, a 50-ft. shaft and 200-ft. adit has opened several seams of ore containing gold and copper. The shaft will be sunk to the 200-ft. level at once. Cross-cuts will be run every 50 feet.

Tonopah, December 17.

WHITE PINE COUNTY.

(Special Correspondence).—W. N. Bowen announces that operations will be resumed shortly at the Bowen-Ely group. Several shoots of gold-bearing quartz have been exposed.—The Boston-Ely shaft cut a body of copper ore at the 1060-ft. point and has penetrated it for 7 ft. without breaking through. It is said that assays of the ore show an average of 11% copper. Some gold and silver occurs.—Parties said to represent the Cole-Ryan interests have taken over the Bingham-Ely group. The Cape Box vein is the principal known orebody.—Two drills are operating steadily at Ely Central and the Eureka and Clipper shafts are going down steadily. A new shaft will be sunk on the Rex claim when the Eureka has attained sufficient depth to require a new hoist. The old plant will be then moved to the new Rex workings.—The management of the Nevada Consolidated company believes it will be able to produce copper in 1910 at a cost considerably below 7c. per lb. It is expected to produce over 70,000,000 lb. of copper in that time. It will install heavier locomotives at Copper Flat, as the ones now in use are hardly of sufficient power to satisfactorily handle the ore, as further depth is attained. Arrangements have been made with Ely Central whereby tracks may be laid on the latter property, and it is ex-

pected to have the final reverberatory furnace in operation early in 1910.

Ely, December 16.

NEW MEXICO.

SIERRA COUNTY.

(Special Correspondence).—The Silver Monument adit is in now over 1500 ft. and is expected to cut the Silver Monument vein within a short distance.—John McConaghy and H. J. Sisty have secured a number of claims on Poverty creek, and commenced active development.—The adit at the U. S. Treasury property has been completed and a raise will be made to the White Eagle shaft. When finished this will block out approximately 25,000 tons of ore in an orebody that is over 35 ft. wide.—The Vanderbilt Mining & Milling Co. has been organized to open the Vanderbilt group of claims west of Chloride. A small amount of work has been done on the property opening bornite containing some gold and silver. W. M. Armour is manager.—The California Mining & Development Co. has been organized to work a group in the southern portion of the district. Julius Wilde is manager.—At the Keystone claim, which B. L. Morrison is operating under lease, new machinery is being installed and a mill will be erected later if the ore proves satisfactory.

Chloride, December 17.

OREGON.

BAKER COUNTY.

The Commercial Mining Co., operating the Rainbow mine, between Huntington and Baker City, has paid two ½c. dividends recently, amounting to \$17,500. A sampling across 10 ft. of the vein gave an average of \$36 per ton, the actual mill-runs for November were, 258 tons, \$16.68 per ton; 236 tons, \$30.94; 236 tons, \$15.82, and 300 tons, \$22.33. The stope width is between 13 and 14 ft., and the tailing ran \$4.31 per ton.

TEXAS.

EL PASO COUNTY.

(Special Correspondence).—The International Smelting & Refining Co., of Boston, is said to be negotiating for the purchase of a site for a large smelter which it will erect near El Paso. This smelter will obtain its ores from Arizona, New Mexico, and Mexico, with the addition of what it may receive from the Texas territory adjacent to El Paso. It is reported that the proposed new smelter will be operated on a copper basis.—The American Smelting & Refining Co. will make extensive improvements to its smelter at El Paso. The decrease in the supply of lead ores is said to have caused the company to decide to make the plant available for handling additional copper ores. Roasting and calcining ovens will be installed and a converter plant erected.

El Paso, December 17.

UTAH.

JUAB COUNTY.

During the month of December the mines of the Tintic district will distribute \$225,000 to shareholders.—In the Iron Blossom mine development is being carried forward at four points in the southern portion of the mine. On the 1300-ft. level a cross-cut is being run to the ore, and on the 500 and 600-ft. levels both driving and cross-cutting is being carried forward.—The adit at the Iron King mine, in the eastern part of the district, is in over 2000 ft., and is expected to open the orebody within the next few hundred feet.—Shipments are being made regularly from the Mammoth mine, and it is the intention of the management to increase the working force at the mine the first of the year, and commence shipping on a larger scale. Samuel McIntyre is manager.—At the Arum property in North Tintic an adit is being driven to cut the vein of lead ore opened by the shaft.—The drift on the 1600-ft. level of the Chief Consolidated has entered the shoot recently opened on the 1400-ft. level, and will be continued to prospect the ground acquired by the Consolidation with the Eureka City Mining Co.—The output of the Scranton mine approximates 550 tons per month, but the management is making

arrangements to increase this by shipping some of the lower-grade ore to paint manufacturers in the East.

SALT LAKE COUNTY.

A drift has been driven 120 ft. on the ore recently cut in North Utah Mining Co.'s mine, in the Tough Nut district, and assays taken from the face run 19% lead.—The Bingham Mines and the Bingham Central Standard Mining companies have consolidated, and will build a hydro-electric plant to furnish power to develop the properties.—The Elvina vein of the Ohio Copper Co. has been recently opened on the 500-ft. level showing the ore to have a copper content of 4% with \$1.80 gold. The vein on this level is 4½ ft. wide.

WASHINGTON.

KING COUNTY.

(Special Correspondence).—The United States Government has established a rescue station at the School of Mines of the University of Washington, Seattle, for instructing and training miners in the use of the Draeger oxygen apparatus in mine rescue work. This includes instruction on the subject of mine gases. The work at this station is in charge of Hugh M. Wolfelin, of the Government Service, and D. C. Botting, State Inspector of Coal Mines. Milnor Roberts, dean of the School of Mines, has arranged for special instruction for mining classes by others outside of the regular members of the university staff, among whom are H. L. Glenn, assayer; R. S. Taylor, smelter superintendent; George J. Jamme, mining engineer, and Henry Landes, State Geologist. Many of the buildings of the Alaska-Yukon-Pacific exposition have become University property.

Seattle, December 18.

OKANOGAN COUNTY.

The Multnomah Mining & Development Co., having 600 acres of mineral land near Nespelem, has eight men at work developing. F. O. Hudnutt, formerly of Colorado, is manager. He states that a well defined vein has been opened by a 300-ft. cross-cut, the ore averaging \$7 per ton in gold, silver, and copper.

SNOHOMISH COUNTY.

The Del Campo Metals Co., of Everett, has just had an examination made of the Del Campo property which it has recently acquired. The ore is a copper-sulphide with some arsenic. There is an excellent site for a hydro-electric plant on the property should the company decide to develop its own power.

STEVENS COUNTY.

(Special Correspondence).—Frank Davy, lessee of the Old Bonanza mine, four miles east of Bossburg, is opening large bodies of silver-lead ore under the old workings and getting profitable returns from the smelter.—A rich deposit of copper ore has been found at a depth of 280 ft. in the Little Giant mine, three miles east of Rockcut. About \$25,000 has been spent by the company on the property.—The most important find in the First Thought mine has been made on the 480-ft. level. Samples from a diamond-drill hole assayed from \$3000 to \$4000 in gold per ton.—The Iago company is preparing to sink a deep shaft on its property near Orient. It will follow the vein from which a number of good assays have been obtained.—Ore has been cut by the adit of the Valley Dew mine.—The Spencer Consolidated Mines Co. has resumed work on its property in the Fisher camp, eight miles east of Orient, after a period of five years of idleness.—In the Tungsten King mine, near Deer Park, ore was found recently which assayed 62% tin. The framework for the concentrator has been set up, and the machinery is now being installed.—At Metaline all of the property of the Spokane Lead Mines has been taken over by an Eastern syndicate which will pay off the indebtedness against the company and start working immediately.—Samples of ore brought from the M. T. mine, in the northern part of the county, assayed as high as \$191 gold and 18 oz. silver per ton. The company is reported to be making a trial shipment of a carload of ore.

Colville, December 18.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—The Consolidated Mining & Smelting Co., of Canada, has purchased the Ikeda group of claims from its Japanese owners. This property, comprising 26 copper claims around Ikeda bay, Moresby island, of the Queen Charlotte group, is practically the only group in that district on which any important amount of development has been done. Two-thirds of the ore shipped from the mine is second class and assays 6% copper, \$4 gold, and \$2 silver; this is run of mine. The first-class ore assays 14% copper, \$6 gold, and \$2.50 silver. The claims were found by Japanese fishermen several years ago, and have been considerably developed on the Lilly group by Awaya, Ikeda & Co., of Vancouver. The property is equipped with an engine, compressor, and 1000-ton ore bunkers at the wharf.—The big stope in the War Eagle ground of the Consolidated is yielding a heavy tonnage of good ore, and, if anything, improving as work goes on. A new stope was opened on the fourth level of the Idaho claim during the week.—At the Velvet-Portland the lessee is working on the third and fourth levels and loading a couple of cars per week, hauling the ore over good snow roads.—As was anticipated, the Granby Consolidated, at its recent meeting of the directors, declared a dividend of 2%, which, on the 135,000 \$100 shares outstanding, will amount in all to \$270,000. This is the eleventh dividend paid by the Granby company since December, 1903; the amount of money shared with the stockholders since that time amounting to \$3,778,630. Dividends amounting to 9% were paid in 1907 and 4% in 1908. The decrease to 2% this year is attributed to the cost of recent improvements of smelting and converting plant. With an improvement in the copper market there is no reason why this company should not pay 10% during 1910, as the mines and smelter are in better form than they have ever been.—The Consolidated Mining & Smelting Co. has bought a mill-site at Boundary Falls, and will erect a concentrator there in the near future to treat the ore from its recently acquired No. 7 mine, near the Central camp.—Four new properties made initial shipments to the Trail smelter during the week, these being the Golden Cup, Meteor, Ohio, and Payday.—The final payment by the Amalgamated Gold Mines of Sheep Creek, Ltd., on a bond covering 25 claims in the heart of the Sheep Creek district, has been made.—A plan of deep development is outlined for the Payne mine. A rich shoot of ore has been cut on the eighth level, thought to be a continuation of the old vein.—Ore has been struck at depth in the Surprise mine, at Sandon, and driving is now being done to ascertain the value of the find.—The Quesnelle Hydraulic Gold Mining Co. is building a dam at Swift river 600 ft. long and 45 ft. high, and will bring 4000 miners' inches of water 26 miles to its property on Quesnelle river. Two miles of 5-in. pipe will be bought in the spring and other additions to the plant made. The company will work 800 men next summer. H. B. Ferguson, of Vancouver, is the engineer in charge of the work.

Rossland, December 16.

The Columbia Copper Co., whose property is on Friday creek, 12 miles from Princeton, is planning the installation of a hydro-electric plant and air-compressor next spring. It is claimed the company has an extensive body of high-grade copper ore. E. P. Wheeler is manager.—M. K. Rogers made the final payment of \$135,000 on the Hidden Creek mine near Fort Simpson. A large amount has been spent in development and it is estimated that \$2,000,000 worth of ore has been blocked out.

MEXICO.

MEXICO.

The Seguranza Mining Co., which is operating the old Amp. de Olvidado claim, in the Zacualpán district, has unwatered the property and is now stopping ore. Electric motors have been installed in the new 100-ton mill and connections made from the main line to the sub-station.—Ore assaying 4 kg. silver and 30% lead has been cut by the adit of the Imperial Mining Co.—The old Rosario adit has been cleaned out by the Veta Negra company and the workings are being sampled.

Personal.

Professional men are invited to send news of their engagements and travels. Such news is interesting to friends.

W. A. HEYWOOD is in Russia.
E. L. OLIVER is in San Francisco.
HERBERT T. BUTCHER is in Algeria.
H. KILBURN SCOTT has been in Spain.
LEWIS T. WRIGHT has gone to London.
HOWARD D. SMITH has gone to French Guinea.
W. H. TREWARTHA-JAMES has arrived in London.
WALTER McDERMOTT is on his way to Johannesburg.
ARTHUR L. PEARSE is on his way back from Alaska.
C. M. ROLKER has returned to London from California.
F. C. BRAY, recently at Abosso, West Africa, is returning to England.

HENRY E. KUPHAL, formerly in California, is now at Missoula, Montana.

C. BARING HORWOOD is manager for the Randfontein South mine at Johannesburg.

F. LYNWOOD GARRISON has left San Francisco for Philadelphia.

J. W. MERCER passed through London on his way to the Continent.

HARRY H. WEBB has returned to London from New York and California.

WALTER G. PERKINS is in London and will soon return to San Francisco.

E. GYBSON SPILSBURY has been examining mines at Tonopah, Nevada.

G. E. WEBBER is returning to Johannesburg, much improved in health.

R. B. NICKERSON has arrived in San Francisco from Rat Portage, Ontario.

R. B. LAMB, of the C. L. Constant Co., will be in northern Mexico about two weeks.

TUDOR G. TREVOR is Inspector of Mines in the Barberton district of the Transvaal.

H. A. TITCOMB is at Salt Lake City, in connection with the Silver King litigation.

F. G. A. ROBERTS, manager of the Knight's Central, Johannesburg, is visiting England.

WALTER McDERMOTT is on his way to Johannesburg, where he will remain three months.

J. W. SUTHERLAND, manager of the Golden Horseshoe mine, is in London from Kalgoorlie.

NEWTON B. KNOX is on his way to Burma to examine tin mines. He will return to London in March.

MARTIN J. HELLER is visiting the Consolidated Arizona smelter, Humboldt, Arizona, as consulting engineer.

A. S. WELLS, of Portland, Oregon, recently examined a placer mining property in the Altar district, Sonora, Mexico.

DESAIX B. MYERS will be at Culiacán, Mexico, January 1 to February 15, after which date he will return to Los Angeles.

GILBERT WALKER arrived at Cape Town in November to negotiate with the Government for the establishment of a steel industry.

P. R. WHITMAN has left the Virginia & Mexico mine, Hostotipaquillo district, to accept a position with the Real del Monte at Pachuca, Mexico.

THE SAN FRANCISCO SECTION of the Mining & Metallurgical Society of America met, following dinner, at the Palace Hotel, December 20. The members and guests present were, S. B. Christy, F. Lynwood Garrison, Clifford Dennis, F. W. Bradley, G. T. Coffee, Eugene Kennedy, E. L. Oliver, C. W. Merrill, L. D. Mills, John D. Hoffmann, Ross B. Hoffmann, C. H. Munro, George Hoffmann, M. L. Requa, J. Ross Browne, Corey C. Brayton, E. J. Molero, and H. F. Bain. The establishment and functions of a National Bureau of Mines was considered.

Market Reports.

LOCAL METAL PRICES.

San Francisco, December 22.

| | | | |
|---------------------|------------|---------------------|---------|
| Antimony | 12-12½c | Quicksilver (flask) | 50½-51 |
| Electrolytic Copper | 16½-16¾c | Spelter | 7½-8¼c |
| Pig Lead | 4.95-5.90c | Tin | 36-37½c |

METAL PRICES.

By wire from New York.

Average daily prices in cents per pound.

| Date. | Electrolytic Copper. | Lead. | Spelter. | Silver, per oz. |
|---------|----------------------|------------|----------|-----------------|
| Dec. 17 | 13.25 | 4.60 | 6.2 | 52½ |
| " 18 | 13.25 | 4.60 | 6.23 | 52¾ |
| " 19 | Sunday. | No market. | | |
| " 20 | 13.25 | 4.60 | 6.23 | 52¾ |
| " 21 | 13.31 | 4.65 | 6.20 | 52¾ |
| " 22 | 13.31 | 4.70 | 6.18 | 52¾ |

ANGLO-AMERICAN SHARES.

Cabled from London.

| | Dec. 16. | Dec. 22. |
|-------------------|----------|----------|
| | £ s. d. | £ s. d. |
| Camp Bird | 1 7 6 | 1 7 6 |
| El Oro | 1 5 10½ | 1 6 3 |
| Esperanza | 2 15 0 | 2 15 0 |
| Dolores | 1 8 9 | 1 8 9 |
| Oroville Dredging | 0 10 9 | 0 10 9 |
| Mexico Mines | 7 5 0 | 6 7 6 |
| Tomboy | 0 19 4½ | 0 19 4½ |

(By courtesy of W. P. Bonbright & Co., 24 Broad St., N. Y.)

COPPER SHARES—BOSTON.

| Closing Prices. | | Closing Prices. | |
|--------------------------|------|---------------------------|-----|
| December 22. | | December 22. | |
| Adventure | 6 | Mohawk | 65 |
| Allouez..... | 57 | North Butte | 53 |
| Atlantic..... | 12 | Old Dominion | 54 |
| Calumet & Arizona | 102½ | Osceola | 163 |
| Calumet & Hecla..... | 665 | Parrot | 28 |
| Centennial | 38½ | Santa Fe | 2½ |
| Copper Range | 83½ | Shannon | 16½ |
| Daly-West | 8½ | Superior & Pittsburg..... | 16½ |
| Franklin | 17 | Tamarack | 68 |
| Granby..... | 107 | Trinity | 9½ |
| Greene-Cananea, ctf..... | 11½ | Utah Con | 45½ |
| Isle Royale | 28½ | Victoria | 4½ |
| La Salle..... | 17½ | Winona | 10½ |
| Mass Copper | 7 | Wolverine | 147 |

(By courtesy of J. C. Wilson, Mills Building.)

SOUTHERN NEVADA STOCKS.

San Francisco, December 22.

| | | | |
|----------------------|------|-----------------------|------|
| Atlanta | \$ 9 | Mayflower | \$ 3 |
| Belmont | 62 | Midway | 19 |
| Booth | 10 | Montana Tonopah | 85 |
| Columbia Mtn | 5 | Nevada Hills | 75 |
| Combination Fraction | 46 | Pittsburg Silver Peak | 76 |
| Daisy | 9 | Rawhide Coalition | 16 |
| Fairview Eagle | 12 | Rawhide Queen | 18 |
| Florence | 2.67 | Round Mountain | 58 |
| Goldfield Con | 8.05 | Sandstorm | 5 |
| Gold Keweenaw | 7 | Silver Pick | 8 |
| Great Bend | 3 | St. Ives | 8 |
| Jim Butler | 10 | Tonopah Extension | 69 |
| Jumbo Extension | 14 | Tonopah of Nevada | 7.40 |
| MacNamara | 27 | West End | 24 |

(By courtesy of the San Francisco Stock & Exchange Board.)

MINING STOCK QUOTATIONS—NEW YORK.

(By wire from Catlin & Powell Co., New York.)

| Closing prices. December 22. | | Closing prices. December 22. | |
|---------------------------------|------|---------------------------------|-----|
| Amalgamated Copper..... | 89½ | Miami Copper..... | 22½ |
| A. S. & R Co..... | 102½ | Mines Co. of America..... | ½ |
| Boston Copper..... | 22½ | Montgomery-Shoshone..... | 1¾ |
| B. C. Copper Co..... | 8¼ | Nevada Con..... | 26¾ |
| Butte Coalition..... | 29¾ | Nevada Utah..... | 1¼ |
| Cumberland-Ely..... | 9½ | Newhouse..... | 4½ |
| Davis-Daly..... | 47½ | Nipissing..... | 10½ |
| Dolores..... | 7¼ | Ohio Copper..... | 6 |
| El Rayo..... | 2¾ | Ray Central..... | 3¾ |
| Ely Central..... | 2¼ | Ray Con..... | 25½ |
| First National..... | 6 | Superior & Pittsburg..... | 16¼ |
| Giroux..... | 11¼ | Tenn. Copper..... | 38¼ |
| Guanajuato Con..... | 17½ | Trinity..... | 9¾ |
| Inspiration..... | 8¼ | Tuolumne Copper..... | 3¼ |
| Kerr Lake..... | 8¾ | United Copper..... | 8 |
| La Rose..... | 47½ | Utah Copper..... | 60¾ |
| Mason Valley..... | 2 | Yukon Gold..... | 47½ |

Decisions Relating to Mining.

Specially reported for the MINING AND SCIENTIFIC PRESS.

EXCESSIVE LOCATION OF MINE.

An excessive mineral location made in good faith and conforming otherwise to the legal requirements is not wholly void, but invalid as to the excessive area only, and in such case, the locator may select the portion of the claim he will reject as such excess.

Waskey v. Hammer, 170 Fed. 31, May '09.

BURNING MINE NOT A NUISANCE.

A mine within the limits of a city and which was being consumed by fire that had existed for two or three years, and was beyond the control of the lessee which had expended its entire capital stock in an effort to extinguish the fire, was held not such a nuisance that the lessee could be ordered to abate. The lessee in such case could at most only be compelled to use its corporate assets and funds in an effort to put out the fire, and this having been done, a court of equity would not compel it to do any more.

McCabe v. Watt, (Pa.) 73 Atl. 453, March '09.

LOCATION OF MINE—CHANGE IN BOUNDARY.

It is immaterial whether the discovery of mineral in the ground claimed and located is made before or after the marking of its boundaries, and the performance of such acts, where recording notice of the location is not required, perfects the location. Hence the fact that a locator on discovering that his boundaries exceeded the amount of ground to which he was entitled, changed one of the lines so as to exclude such excess, and in so doing, he excluded the hole in which he made his discovery; but this did not vitiate his entire claim, provided he made another discovery within the boundaries as changed before any rights in the premises had been acquired by another.

Waskey v. Hammer, 170 Fed. 31, May '09.

PURCHASE OF MINING CLAIM—LIABILITY OF THIRD PERSON FOR FRAUD.

The lessees of a mining claim had an option to purchase the claim for \$75,000, but by a separate agreement the owner and lessor agreed in case of purchase to refund to the lessees the sum of \$35,000 of the purchase price. The lessees by false representations and by concealing the fact of the second agreement, induced a third person to become a joint purchaser with them and to pay \$37,500 for a half interest in the claim. The lessees not having sufficient money, applied to another third person, stating to him the facts and showing him both contracts, and he thereupon agreed to advance the money necessary to make the payments until the real consideration of \$40,000 should be paid, and thereupon he was to secretly receive the subsequent payments made by the purchaser taking such half interest with the lessees; and for this accommodation he was to receive also a third interest in the half of the claim that was to be conveyed to the original lessees. After the first payment of \$20,000, the purchaser of such half interest became suspicious and refused to pay more, and thereupon such other third person advancing the money for the lessees, completed the payments and obtained title to the property. Subsequently, the original purchaser of the half interest of the claim sued the person advancing the money for the lessees and who subsequently purchased the entire claim, to recover the sum originally paid by him. And the person thus advancing the money for the lessees and afterward purchasing the claim was held liable on the ground that by intentionally joining with the lessees in the deception, he thereby became a joint purchaser and assumed the obligations of good faith incident to that relation, and that both he and the property in his hands were liable for the amount necessary to make restitution for the fraud.

Cunningham v. Pettigrew, 169 Fed. 335, Jan. 09.

Publications Received.

Any of the books noticed in these columns are for sale by, or can be procured from, the MINING AND SCIENTIFIC PRESS.

MINERAL PRODUCTION OF CALIFORNIA FOR 1908. California State Mining Bureau, Bull. 54, 1909. A table showing production by counties.

MINERAL PRODUCTION OF CALIFORNIA. California State Mining Bureau, Bull. 55, 1909.

The production for the past 22 years is presented in tabular form by subject.

UNIVERSITY OF PITTSBURG. School of Mines Edition. Bull. Vol. V, No. 2. Pp. 158. Pittsburg, 1909.

A general account of the organization of the school with plans for its work.

MINERAL RESOURCES OF THE UNITED STATES IN 1908. U. S. Geological Survey, Washington, 1909. Advance chapters as follows are now available: Platinum, D. T. Day; Stone and Lime, A. T. Coons; Silver, Copper, Lead, and Zinc in the Central States, B. S. Butler and C. E. Siebenthal; Tungsten, Nickel, Cobalt, Vanadium, Titanium, Molybdenum, Uranium, and Tantalum, F. L. Hess.

PHYSICAL FEATURES OF THE DES PLAINES VALLEY. By J. W. Goldthwaite. Illinois State Geol. Surv., Bull. 11. Pp. 103, ill., index. Urbana, 1909.

This forms the second of the bulletins in the 'Educational Series' which the Illinois Survey is publishing. Mr. Goldthwaite has made excellent use of the interesting material which he had and the result is a bulletin which will be of more than local interest to geologists and physiographers as well as laymen.

THE PREVENTION OF INDUSTRIAL ACCIDENTS. The Fidelity & Casualty Co., of New York. Pp. 190. New York, 1909. Price 25 cents.

This is a general, illustrated discussion of the causes and means of prevention of accidents especially in connection with steam boilers, engines, elevators, electric apparatus, and under general factory conditions. It has been carefully prepared by F. E. Law and William Newell, of the staff of the Casualty company. A similar pamphlet discussing mining conditions would be of great value.

DESCRIPTIVE SKETCH OF THE GEOLOGY AND ECONOMIC MINERALS OF CANADA. By G. A. Young, with introduction by R. W. Brock, Canada, Department of Mines, Geological Survey Branch. Pub. N. 1085, Pp. 151, ill., index, map.

The usefulness of such general handbooks as this is widely recognized. In a country such as Canada where, as Mr. Brock points out, less than half the territory has been prospected, it is peculiarly necessary to issue repeated editions of works which disseminate what little is known. Only by educating many to the possibilities of the field can its resources be developed. From 1886 to 1909 the per capita mineral production increased from \$2.23 to \$12.57, having in 1908 amounted to a total of \$87,000,000. From this it can be seen that the excellent work done by the Geological Survey and the Mines Branch is bringing results.

THE RECOGNITION OF MINERALS. By C. G. Moor. With monographs on Geology, Ore Deposits, etc., by Donald A. MacAllister. Pp. 245, index. *The Mining Journal*, London, 1909. Price \$2.25.

The avoidance of scientific method and terms in this book will commend it to those unused to technical treatises. Unfortunately the statements are sometimes misleading, for example, where it is said that quartz is an essential constituent only of acid and moderately acid rocks; and again where the affirmation is made that "all ores tend to 'slime' more or less; some, such as cinnabar and copper carbonate, so much so that wet treatment is nearly useless." The selection of these examples of sliming ores completely misses the point of difficulty which arises in practice with the ores which any metallurgist would undertake to treat. The book is wide in its scope, but is essentially amateurish.

Calorific Value of California Fuel Oil.

By R. W. FENN.

*The accompanying tabulated comparison of California crude oils of different densities has been compiled as below from a large number of laboratory and running tests made by various chemists and practical experts. The primary object in preparing this table was to ascertain definitely whether there was any absolute connection between the density, as indicated by degrees of the Baumé scale, and the calorific value of the oils. The result of a careful digestion and comparison of the data secured from diverse but reliable sources was the justification of the belief that a perfect sliding scale would quite accurately conform to practical calorific values.

It must be borne in mind, however, that for practical purposes no table can be made more than closely approximate in character, owing to the great variety of methods used in burning the oil, the efficiency of some methods being considerably greater than that of others, and owing also to the intermittent character of tests made with the same burner and equipment, due to clogging of burners, change of draft, or the personal equations of those in charge of the plant.

| Degrees Baumé. | Specific gravity. | Weight per bbl. | B. T. U. per lb. | B. T. U. per bbl. |
|----------------|-------------------|-----------------|------------------|-------------------|
| 10..... | 1.0000 | 350 | 18,380 | 6,442,006 |
| 11..... | 0.9930 | 348 | 18,440 | 6,417,868 |
| 12..... | 0.9861 | 346 | 18,500 | 6,393,970 |
| 13..... | 0.9791 | 343 | 18,560 | 6,370,035 |
| 14..... | 0.9722 | 341 | 18,620 | 6,345,324 |
| 15..... | 0.9658 | 339 | 18,680 | 6,323,180 |
| 16..... | 0.9594 | 336 | 18,740 | 6,301,512 |
| 17..... | 0.9530 | 334 | 18,800 | 6,279,576 |
| 18..... | 0.9466 | 332 | 18,860 | 6,257,371 |
| 19..... | 0.9402 | 330 | 18,920 | 6,234,708 |
| 20..... | 0.9339 | 327 | 18,980 | 6,212,534 |
| 21..... | 0.9280 | 325 | 19,040 | 6,192,950 |
| 22..... | 0.9222 | 323 | 19,100 | 6,173,500 |
| 23..... | 0.9163 | 321 | 19,160 | 6,153,426 |
| 24..... | 0.9105 | 319 | 19,220 | 6,133,486 |
| 25..... | 0.9047 | 317 | 19,280 | 6,113,495 |
| 26..... | 0.8989 | 315 | 19,340 | 6,093,260 |
| 27..... | 0.8930 | 313 | 19,400 | 6,072,006 |
| 28..... | 0.8872 | 311 | 19,460 | 6,051,282 |
| 29..... | 0.8814 | 309 | 19,520 | 6,030,118 |
| 30..... | 0.8755 | 307 | 19,580 | 6,008,319 |
| 31..... | 0.8702 | 305 | 19,640 | 5,990,200 |
| 32..... | 0.8650 | 303 | 19,700 | 5,972,646 |
| 33..... | 0.8597 | 301 | 19,760 | 5,954,083 |
| 34..... | 0.8544 | 299 | 19,820 | 5,935,297 |
| 35..... | 0.8492 | 298 | 19,880 | 5,917,083 |
| 36..... | 0.8443 | 296 | 19,940 | 5,900,645 |
| 37..... | 0.8395 | 294 | 20,000 | 5,884,800 |
| 38..... | 0.8346 | 293 | 20,050 | 5,865,026 |
| 39..... | 0.8299 | 291 | 20,100 | 5,846,487 |
| 40..... | 0.8251 | 289 | 20,150 | 5,827,179 |
| 41..... | 0.8204 | 288 | 20,200 | 5,808,308 |
| 42..... | 0.8157 | 286 | 20,250 | 5,789,475 |
| 43..... | 0.8110 | 284 | 20,300 | 5,770,275 |
| 44..... | 0.8063 | 283 | 20,350 | 5,750,910 |
| 45..... | 0.8017 | 281 | 20,400 | 5,732,196 |

*Engineering News, Vol. 61, No. 19.

A Primer on Explosives.

In continuance of its efforts to reduce the number of fatal accidents in American coal mines, the United States Geological Survey has just issued a primer for the benefit of miners and others who have anything to do with explosives. The book, which is written in plain, non-technical language, describes how and of what materials explosives are made, points out the dangers in their use, and shows how these may be avoided or reduced to a minimum.

The improper use of explosives in coal mines is doubtless the cause of many deaths that are attributed to other agencies. Vigorous objection is made to the use of black powder in any mine where there is danger of a gas or coal-

dust explosion. The operators and miners in such mines are urged to use explosives that have been tested at the Survey's mine-accident station at Pittsburg, Pennsylvania, and placed on the 'permissible' list. Investigations at this station have proved that the flame from the explosion of black powder lasts from 2500 to 3500 times as long as the flame from the newer explosives, and is therefore more likely to ignite gas or dust in mines.

The use of explosives is increasing both in quantity and in the variety of purposes to which they are applied. They are now made at 150 plants in different parts of the country, and the product of a single year is now nearly 500,000,000 lb. Of all this material no explosive is safe in the hands of a careless or ignorant person, whether it is used in mining or otherwise. Statistics recently compiled by the railway bureau for the safe transportation of explosives show that more than 400 persons have been killed or injured and over \$3,000,000 worth of property destroyed by explosives in transit by rail. The fact that three years of co-operative effort under the supervision of this bureau have reduced these losses to almost nothing should encourage the hope that similar co-operative efforts may likewise greatly reduce losses of life and property from the use of explosives in mining.

The additions from time to time to the large death roll of our mines make a recurring appeal to the American public for fair treatment of the coal-mining industry and to the miner and the manager that they co-operate in every possible effort for greater safety. It may not be possible under existing conditions to prevent all mine accidents. Little may be done by either the operators or the miners working alone, but experience in all countries shows that by hearty and determined co-operation of the two these accidents may be greatly reduced. This can be accomplished only by means of wise laws and regulations based on fact and experience, and by the strictest possible discipline.

Tungsten.

A report on the tungsten ores of Canada, by T. L. Walker, of Toronto University, has recently been issued by the Mines Branch of the Department of Mines of Canada at Ottawa. The report covers 56 pages. Among the rare metals which have recently become of commercial value, tungsten is an important example. One of its newest applications is as a filament in incandescent lamps, in which it gives a much more brilliant light with greater efficiency than carbon. Its most important use, however, is in the manufacture of tungsten steel, to which it imparts great elasticity and tensile strength. The metal has, therefore, become particularly valuable to the manufacturers of special steels. The known occurrences of tungsten ores throughout the world are comparatively few, which fact lends additional interest to some discoveries of scheelite (an ore of tungsten), which have been made within the past two years in Nova Scotia. These, together with other occurrences of tungsten ores in Canada, have been made the subject of the present report, which is designed to present to those interested all the available information on these ores. The several occurrences of tungsten ore in Canada are described in detail, and a general statement is given on the geological occurrence of the ores, chemical tests, concentration, the uses of the metal, producing mines in other countries, and statistics of the world's production, while a useful bibliography of the literature on Canadian and United States occurrences is added.

L. VOGELSTEIN & Co. give the following figures of German consumption of foreign copper for the months January to October 1909:

| | |
|------------------------|---------|
| | Tons. |
| Imports of copper..... | 130,556 |
| Exports of copper..... | 6,699 |

Consumption of copper..... 123,857
as compared with consumption during the same period in 1908 of 128,006 tons. Of the above quantity 119,329 tons was imported from the United States.

